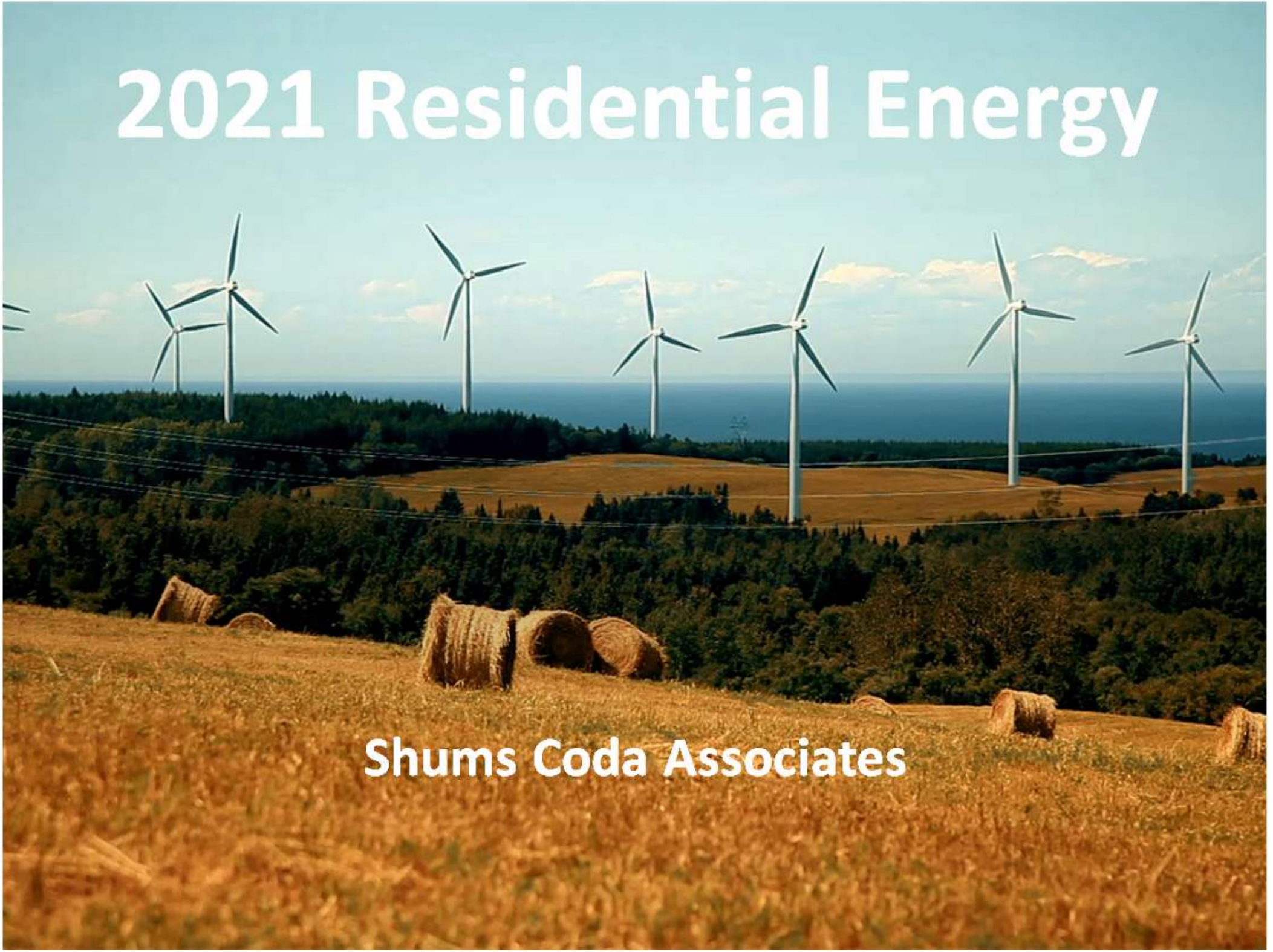
2021 Residential Energy



Shums Coda Associates

2021 Residential Energy

Shums Coda Associates

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Instructor
Gil Rossmiller

Over 40 years in the construction industry

IRC Plumbing & Mechanical Code Development Committee 2009-2012

Commercial Energy Code Development Committee 2015-2018

Residential Energy Code Development Committee 2021-2024

2003 – 2016
Building Official
Parker, Colorado

 2

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Resources

- 2021 International Energy Conservation Code
- 2021 Significant Changes
- ICC Online Codes

2021 International Energy Conservation Code (IECC) PREMIUM

Remove from Favorites

The 2021 IECC® addresses energy efficiency on several fronts including cost, energy usage, use of natural resources and the impact of energy usage on the environment.

https://codes.iccsafe.org/content/IECC2021P2

3

2000 IECC

 4

4

2000 IECC

TABLE 602.1
SIMPLIFIED PRESCRIPTIVE BUILDING ENVELOPE THERMAL COMPONENT CRITERIA
MINIMUM REQUIRED THERMAL PERFORMANCE (*U*-FACTOR AND *R*-VALUE)

HEATING DEGREE DAYS	MAXIMUM	MINIMUM					
	Glazing *U*-factor	Ceiling *R*-value	Wall *R*-value	Floor *R*-value	Basement wall *R*-value	Slab perimeter *R*-value and depth	Crawl space wall *R*-value
0-499	Any	R-13	R-11	R-11	R-0	R-0	R-0
500-999	0.90	R-19	R-11	R-11	R-0	R-0	R-4
1,000-1,499	0.75	R-19	R-11	R-11	R-0	R-0	R-5
1,500-1,999	0.75	R-26	R-13	R-11	R-5	R-0	R-5
2,000-2,499	0.65	R-30	R-13	R-11	R-5	R-0	R-6
2,500-2,999	0.60	R-30	R-13	R-19	R-6	R-4, 2 ft.	R-7
3,000-3,499	0.55	R-30	R-13	R-19	R-7	R-4, 2ft.	R-8
3,500-3,999	0.50	R-30	R-13	R-19	R-8	R-5, 2 ft.	R-10
4,000-4,499	0.45	R-38	R-13	R-19	R-8	R-5, 2 ft.	R-11
4,500-4,999	0.45	R-38	R-16	R-19	R-9	R-6, 2 ft.	R-17
5,000-5,499	0.45	R-38	R-18	R-19	R-9	R-6, 2 ft.	R-17
5,500-5,999	0.40	R-38	R-18	R-21	R-10	R-9, 4 ft.	R-19
6,000-6,499	0.35	R-38	R-18	R-21	R-10	R-9, 4 ft.	R-20
6,500-6,999	0.35	R-49	R-21	R-21	R-11	R-11, 4 ft.	R-20
7,000-8,499	0.35	R-49	R-21	R-21	R-11	R-13, 4 ft.	R-20
8,500-8,999	0.35	R-49	R-21	R-21	R-18	R-14, 4 ft.	R-20

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2003 IECC

TABLE 602.1
SIMPLIFIED PRESCRIPTIVE BUILDING ENVELOPE THERMAL COMPONENT CRITERIA
MINIMUM REQUIRED THERMAL PERFORMANCE (*U*-FACTOR AND *R*-VALUE)

CLIMATE ZONE	HEATING DEGREE DAYS	MAXIMUM	MINIMUM					
		Glazing *U*-factor	Ceiling *R*-value	Wall *R*-value	Floor *R*-value	Basement wall *R*-value	Slab perimeter *R*-value and depth	Crawl space wall *R*-value
1	0 - 499	Any	R-13	R-11	R-11	R-0	R-0	R-0
2	500 - 999	0.90	R-19	R-11	R-11	R-0	R-0	R-4
3	1,000 - 1,499	0.75	R-19	R-11	R-11	R-0	R-0	R-5
4	1,500 - 1,999	0.75	R-26	R-13	R-11	R-5	R-0	R-5
5	2,000 - 2,499	0.65	R-30	R-13	R-11	R-5	R-0	R-6
6	2,500 - 2,999	0.60	R-30	R-13	R-19	R-6	R-4, 2 ft.	R-7
7	3,000 - 3,499	0.55	R-30	R-13	R-19	R-7	R-4, 2 ft.	R-8
8	3,500 - 3,999	0.50	R-30	R-13	R-19	R-8	R-5, 2 ft.	R-10
9	4,000 - 4,499	0.45	R-38	R-13	R-19	R-8	R-5, 2 ft.	R-11
10	4,500 - 4,999	0.45	R-38	R-16	R-19	R-9	R-6, 2 ft.	R-17
11	5,000 - 5,499	0.45	R-38	R-18	R-19	R-9	R-6, 2 ft.	R-17
12	5,500 - 5,999	0.40	R-38	R-18	R-21	R-10	R-9, 4 ft.	R-19
13	6,000 - 6,499	0.35	R-38	R-18	R-21	R-10	R-9, 4 ft.	R-20
14	6,500 - 6,999	0.35	R-49	R-21	R-21	R-11	R-11, 4 ft.	R-20
15	7,000 - 8,499	0.35	R-49	R-21	R-21	R-11	R-13, 4 ft.	R-20
16	8,500 - 8,999	0.35	R-49	R-21	R-21	R-18	R-14, 4 ft.	R-20
17	9,000 - 12,999	0.35	R-49	R-21	R-21	R-19	R-18, 4 ft.	R-20

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2006 IECC

TABLE 402.1.1
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	FENESTRATION *U*-FACTOR	SKYLIGHT[b] *U*-FACTOR	GLAZED FENESTRATION SHGC	CEILING *R*-VALUE	WOOD FRAME WALL *R*-VALUE	MASS WALL *R*-VALUE	FLOOR *R*-VALUE	BASEMENT[c] WALL *R*-VALUE	SLAB[d] *R*-VALUE & DEPTH	CRAWL SPACE[c] WALL *R*-VALUE
1	1.20	0.75	0.40	30	13	3	13	0	0	0
2	0.75	0.75	0.40	30	13	4	13	0	0	0
3	0.65	0.65	0.40[h]	30	13	5	19	0	0	5 / 13
4 except Marine	0.40	0.60	NR	38	13	5	19	10 / 13	10, 2 ft	10 / 13
5 and Marine 4	0.35	0.60	NR	38	19 or 13+5[h]	13	30[f]	10 / 13	10, 2 ft	10 / 13
6	0.35	0.60	NR	49	19 or 13+5[h]	15	30[f]	10 / 13	10, 4 ft	10 / 13
7 and 8	0.35	0.60	NR	49	21	19	30[f]	10 / 13	10, 4 ft	10 / 13

2009 IECC

TABLE 402.1.1
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	FENESTRATION *U*-FACTOR[b]	SKYLIGHT[b] *U*-FACTOR	GLAZED FENESTRATION SHGC[b,e]	CEILING *R*-VALUE	WOOD FRAME WALL *R*-VALUE	MASS WALL *R*-VALUE[i]	FLOOR *R*-VALUE	BASEMENT[c] WALL *R*-VALUE	SLAB[d] *R*-VALUE & DEPTH	CRAWL SPACE[c] WALL *R*-VALUE
1	1.2	0.75	0.30	30	13	3/4	13	0	0	0
2	0.65[j]	0.75	0.30	30	13	4/6	13	0	0	0
3	0.50[j]	0.65	0.30	30	13	5/8	19	5/13[f]	0	5/13
4 except Marine	0.35	0.60	NR	38	13	5/10	19	10 /13	10, 2 ft	10/13
5 and Marine 4	0.35	0.60	NR	38	20 or 13+5[h]	13/17	30[g]	10/13	10, 2 ft	10/13
6	0.35	0.60	NR	49	20 or 13+5[h]	15/19	30[g]	15/19	10, 4 ft	10/13
7 and 8	0.35	0.60	NR	49	21	19/21	38[g]	15/19	10, 4 ft	10/13

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2012 IECC

TABLE R402.1.1
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	FENESTRATION *U*-FACTOR[b]	SKYLIGHT[b] *U*-FACTOR	GLAZED FENESTRATION SHGC[b, e]	CEILING *R*-VALUE	WOOD FRAME WALL *R*-VALUE	MASS WALL *R*-VALUE[i]	FLOOR *R*-VALUE	BASEMENT[c] WALL *R*-VALUE	SLAB[d] *R*-VALUE & DEPTH	CRAWL SPACE[c] WALL *R*-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.35	0.55	0.25	38	20 or 13+5[h]	8/13	19	5/13[f]	0	5/13
4 except Marine	0.35	0.55	0.40	49	20 or 13+5[h]	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.32	0.55	NR	49	20 or 13+5[h]	13/17	30[g]	15/19	10, 2 ft	15/19
6	0.32	0.55	NR	49	20+5 or 13+10[h]	15/20	30[g]	15/19	10, 4 ft	15/19
7 and 8	0.32	0.55	NR	49	20+5 or 13+10[h]	19/21	38[g]	15/19	10, 4 ft	15/19

2015 IECC

TABLE R402.1.2
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	FENESTRATION *U*-FACTOR[b]	SKYLIGHT[b] *U*-FACTOR	GLAZED FENESTRATION SHGC[b, e]	CEILING *R*-VALUE	WOOD FRAME WALL *R*-VALUE	MASS WALL *R*-VALUE[i]	FLOOR *R*-VALUE	BASEMENT[c] WALL *R*-VALUE	SLAB[d] *R*-VALU E & DEPTH	CRAWL SPACE[c] WALL *R*-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.35	0.55	0.25	38	20 or 13+5[h]	8/13	19	5/13[f]	0	5/13
4 except Marine	0.35	0.55	0.40	49	20 or 13+5[h]	8/13	19	10 /13	10, 2 ft	10/13
5 and Marine 4	0.32	0.55	NR	49	20 or 13+5[h]	13/17	30[g]	15/19	10, 2 ft	15/19
6	0.32	0.55	NR	49	20+5 or 13+10[h]	15/20	30[g]	15/19	10, 4 ft	15/19
7 and 8	0.32	0.55	NR	49	20+5 or 13+10[h]	19/21	38[g]	15/19	10, 4 ft	15/19

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2018 IECC

TABLE R402.1.2
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	FENESTRATION *U*-FACTOR[b]	SKYLIGHT[b] *U*-FACTOR	GLAZED FENESTRATION SHGC[b, e]	CEILING *R*-VALUE	WOOD FRAME WALL *R*-VALUE	MASS WALL *R*-VALUE[i]	FLOOR *R*-VALUE	BASEMENT[c] WALL *R*-VALUE	SLAB[d] *R*-VALUE & DEPTH	CRAWL SPACE[c] WALL *R*-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.32	0.55	0.25	38	20 or 13+5[h]	8/13	19	5/13[f]	0	5/13
4 except Marine	0.32	0.55	0.40	49	20 or 13+5[h]	8/13	19	10 /13	10, 2 ft	10/13
5 and Marine 4	0.30	0.55	NR	49	20 or 13+5[h]	13/17	30[g]	15/19	10, 2 ft	15/19
6	0.30	0.55	NR	49	20+5[h] or 13+10[h]	15/20	30[g]	15/19	10, 4 ft	15/19
7 and 8	0.30	0.55	NR	49	20+5[h] or 13+10[h]	19/21	38[g]	15/19	10, 4 ft	15/19

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2021 IECC

CLIMATE ZONE	FENESTRATION *U*-FACTOR[b, i]	SKYLIGHT[b] *U*-FACTOR	GLAZED FENESTRATION SHGC[b, e]	CEILING *R*-VALUE	WOOD FRAME WALL *R*-VALUE[g]	MASS WALL *R*-VALUE[h]	FLOOR *R*-VALUE	BASEMENT[c, g] WALL *R*-VALUE	SLAB[d] *R*-VALUE & DEPTH	CRAWL SPACE[c, g] WALL *R*-VALUE
0	NR	0.75	0.25	30	13 or 0& 10ci	3/4	13	0	0	0
1	NR	0.75	0.25	30	13 or 0& 10ci	3/4	13	0	0	0
2	0.40	0.65	0.25	49	13 or 0& 10ci	4/6	13	0	0	0
3	.30	0.55	0.25	49	20 or 13& 5ci[h] or 0& 15ci[h]	8/13	19	5ci or 13[f]	10ci, 2 ft	5ci or 13[f]
4 except Marine	.30	0.55	0.40	60	30 or 20&5ci[h] or 13& 10ci[h] or 0&20ci[h]	8/13	19	10ci or 13	10ci, 4 ft	10ci or 13
5 and Marine 4	0.30[j]	0.55	0.40	60	30 or 20&5ci[h] or 13& 10ci[h] or 0&20ci[h]	13/17	30	15ci or 19 or 13& 5ci	10ci, 4 ft	15ci or 19 or 13& 5ci
6	0.30[j]	0.55	NR	60	30 or 20&5ci[h] or 13& 10ci[h] or 0&20ci[h]	15/20	30	15ci or 19 or 13& 5ci	10ci, 4 ft	15ci or 19 or 13& 5ci
7 and 8	0.30[j]	0.55	NR	60	30 or 20&5ci[h] or 13&10ci[h] or 0&20ci[h]	19/21	38	15ci or 19 or 13& 5ci	10ci, 4 ft	15ci or 19 or 13& 5ci

 10

10

R101.2 Scope

This code applies to residential buildings, building sites and associated systems and equipment.

 11

11

R101.3 Intent

This code shall regulate the design and construction of buildings for the effective use and conservation of energy over the useful life of each building. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this objective.

This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances

 12

12

R101.4.1 Mixed residential and commercial buildings

Where a building includes both residential building and commercial building portions, each portion shall be separately considered and meet the applicable provisions of the IECC—Commercial Provisions or IECC—Residential Provisions.

 13

13

Residential VS Commercial

Definition of Residential per IECC is different than that found in the IRC and IBC:

RESIDENTIAL BUILDING

- For this code, includes detached one- and two family dwellings and multiple single-family dwellings (townhouses) as well as Group R-2, R-3 and R-4 buildings three stories or less in height above grade plane

How is the IECC used for this type of building?

COMMERCIAL BUILDING. For this code, all buildings that are not included in the definition of "Residential buildings."

 14

14

R103.2 Information on construction documents

1. Energy compliance path
2. Insulation materials and their R-values.
3. Fenestration U-factors and solar heat gain coefficients (SHGC).
4. Area-weighted U-factor and solar heat gain coefficients (SHGC) calculations.
5. Mechanical system design criteria.
6. Mechanical and service water-heating systems and equipment types, sizes and efficiencies.
7. Equipment and system controls.
8. Duct sealing, duct and pipe insulation and location.
9. Air sealing details.

 15

15

R103.2.1 Building thermal envelope depiction

The building thermal envelope shall be represented on the construction documents.

 16

16

R105.2 Required inspections

R105.2.1 Footing and foundation inspection

Inspections associated with footings and foundations shall verify compliance with the code as to R-value, location, thickness, depth of burial and protection of insulation as required by the code and approved plans and specifications.

 17

17

R105.2 Required inspections

R105.2.2 Framing and rough-in inspection

Inspections at framing and rough-in shall be made before application of interior finish and shall verify compliance with the code as to:

types of insulation and corresponding R-values and their correct location and proper installation;

Fenestration properties such as U-factor and SHGC and proper installation;

air leakage controls as required by the code;

And approved plans and specifications.

 18

18

R105.2 Required inspections

R105.2.3 Plumbing rough-in inspection

Inspections at plumbing rough-in shall verify compliance as required by the code and approved plans and specifications as to types of insulation and corresponding R-values and protection, and required controls.

 19

19

R105.2 Required inspections

R105.2.4 Mechanical rough-in inspection

Inspections at mechanical rough-in shall verify compliance as required by the code and approved plans and specifications as to installed HVAC equipment type and size, required controls, system insulation and corresponding R-value, system air leakage control, programmable thermo-stats, dampers, whole-house ventilation, and minimum fan efficiency.

 20

20

R105.2 Required inspections

R105.2.5 Final inspection

The building shall have a final inspection and shall not be occupied until approved. The final inspection shall include verification of the installation of all required building systems, equipment and controls and their proper operation and the required number of high-efficacy lamps and fixtures

 21

21

Definitions

ABOVE-GRADE WALL

A wall more than 50 percent above grade and enclosing conditioned space. This includes between-floor spandrels, peripheral edges of floors, roof and basement knee walls, dormer walls, gable end walls, walls enclosing a mansard roof and skylight shafts

 22

22

Definitions

AIR BARRIER

One or more materials joined together in a continuous manner to restrict or prevent the passage of air through the building thermal envelope and its assemblies.

 23

23

Definitions

BUILDING THERMAL ENVELOPE

The basement walls, exterior walls, floors, ceiling, roofs and any other building element assemblies that enclose conditioned space or provide a boundary between conditioned space and exempt or unconditioned space

 24

24

Definitions

FENESTRATION. Products classified as either vertical fenestration or skylights.

Skylights

Glass or other transparent or translucent glazing material installed at a slope of less than 60 degrees from horizontal including unit skylights, tubular daylighting devices, and glazing materials in solariums, sunrooms, roofs and sloped walls.

Vertical fenestration

Windows that are fixed or operable, opaque doors, glazed doors, glazed block and combination opaque/glazed doors composed of glass or other transparent or translucent glazing materials and installed at a slope of not less than 60 degrees from horizontal.

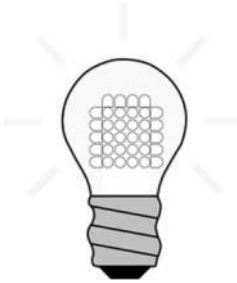
 25

25

Definitions

HIGH-EFFICACY LIGHT SOURCES

Any lamp with an efficacy of not less than 65 lumens per watt, or luminaires with an efficacy of not less than 45 lumens per watt.



 26

26

Definitions

DWELLING UNIT ENCLOSURE AREA

The sum of the area of ceiling, floors, and walls separating a dwelling unit's conditioned space from the exterior or from adjacent conditioned or unconditioned spaces. Wall height shall be measured from the finished floor of the dwelling unit to the underside of the floor above.

 27

27

Definitions

CAVITY INSULATION

Insulating material located between framing members

 28

28

Definitions

CONTINUOUS INSULATION (ci)

Insulating material that is continuous across all structural members without thermal bridges other than fasteners and service openings. It is installed on the interior or exterior, or is integral to any opaque surface, of the building envelope.

 29

29

Definitions

SUNROOM

A one-story structure attached to a dwelling with a glazing area in excess of 40 percent of the gross area of the structure's exterior walls and roof.

 30

30

Definitions

RESIDENTIAL BUILDING

For this code, includes detached one- and two-family dwellings and townhouses as well as Group R-2, R-3 and R-4 buildings three stories or less in height above grade plane.

 31

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Climate Zones

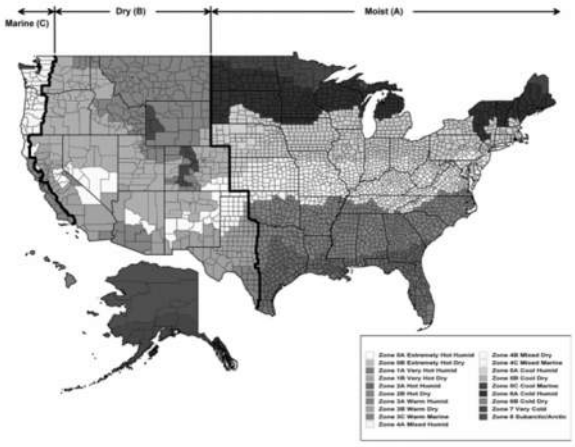

FIGURE R301.1
CLIMATE ZONES

32

32

Climate Zones

TABLE R301.1 CLIMATE ZONES, MOISTURE REGIMES, AND WARM HUMID DESIGNATIONS BY STATE, COUNTY AND TERRITORY[a]

MONTANA
6B (all)

a. Key: A – Moist, B – Dry, C – Marine. Absence of moisture designation indicates moisture regime is irrelevant. Asterisk (*) indicates a Warm Humid location.

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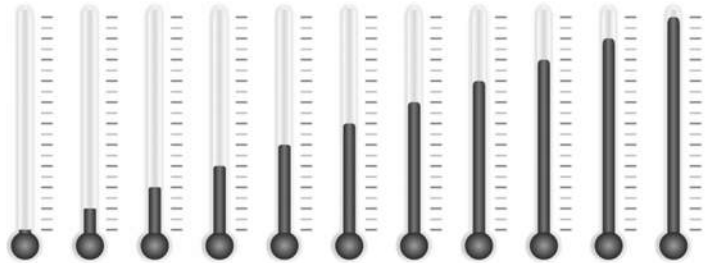
R302.1 Interior design conditions

The interior design temperatures used for heating and cooling load calculations shall be a maximum of 72°F for heating and minimum of 75°F for cooling.



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Tables R301.2(1)

TABLE R301.2(1)
CLIMATIC AND GEOGRAPHIC DESIGN CRITERIA

GROUND SNOW LOAD[a]	WIND DESIGN				SEISMIC DESIGN CATEGORY[e]	SUBJECT TO DAMAGE FROM			ICE BARRIER UNDERLAYMENT REQUIRED[g]	FLOOD HAZARDS[h]	AIR FREEZING INDEX[i]	MEAN ANNUAL TEMP[j]
	Speed[d] (mph)	Topographic Effects[f]	Special wind Region[c]	Windborne debris zone[c]		Weathering[c]	Frost line depth[b]	Termite[c]				
—	—	—	—	—	—	—	—	—	—	—	—	—

MANUAL J DESIGN CRITERIA[m]

Elevation	Altitude correction factor[n]	Summer design grains	Indoor winter design relative humidity	Indoor winter design dry bulb temperature	Outdoor winter design dry bulb temperature	Heating temperature difference
—	—	—	—	—	—	—
Latitude	**Daily range**	**Coincident wet bulb**	**Indoor summer design relative humidity**	**Indoor summer design dry bulb temperature**	**Outdoor summer design dry bulb temperature**	**Cooling temperature difference**
—	—	—	—	—	—	—

35

R303.1.2 Insulation mark installation

Insulating materials shall be installed such that the manufacturer's R-value mark is readily observable at inspection. For insulation materials that are installed without an observable manufacturer's R-value mark, such as blown or draped products, an insulation certificate complying with Section R303.1.1 shall be left immediately after installation by the installer, in a conspicuous location within the building, to certify the installed R-value of the insulation material.

36

R303.1.3 Fenestration product rating

U-factors of fenestration products such as windows, doors and skylights shall be determined in accordance with NFRC 100.

Exception: Where required, garage door U-factors shall be determined in accordance with either NFRC 100 or ANSI/DASMA 105.

U-factors shall be determined by an accredited, independent laboratory, and labeled and certified by the manufacturer.

 37

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R303.1.5 Air-impermeable insulation

Insulation having an air permeability not greater than 0.004 cubic feet per minute per square foot under pressure differential of 0.3 inch water gauge (75 Pa) when tested in accordance with ASTM E2178 shall be determined air-impermeable insulation.

 38

38

R303.3 Maintenance information

Maintenance instructions shall be furnished for equipment and systems that require preventive maintenance. Required regular maintenance actions shall be clearly stated and incorporated on a readily visible label. The label shall include the title or publication number for the operation and maintenance manual for that particular model and type of product.

 39

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Compliance paths

R401.2.1 Prescriptive Compliance Option

The Prescriptive Compliance Option requires compliance with Sections R401 through R404.

U-factor, R-value alternative, Total UA

R401.2.2 Total Building Performance Option

The Total Building Performance Option requires compliance with Section R405.

R401.2.3 Energy Rating Index Option

The Energy Rating Index (ERI) Option requires compliance with Section R406

R401.2.4 Tropical Climate Region Option

The Tropical Climate Region Option requires compliance with Section R407.

 40

40

R401.2.5 Additional energy efficiency

This section establishes additional requirements applicable to all compliance approaches to achieve additional energy efficiency.

1. For buildings complying with Section R401.2.1, one of the additional efficiency package options shall be installed according to Section R408.2
2. For buildings complying with Section R401.2.2,the building shall meet one of the following:
   - 2.1. One of the additional efficiency package options in Section R408.2 shall be installed without including such measures in the proposed design under SectionR405; or
   - 2.2. The proposed design of the building under Section R405.2 shall have an annual energy cost that is less than or equal to 95 percent of the annual energy cost of the standard reference design.
3. For buildings complying with the Energy Rating Index alternative Section R401.2.3, the Energy Rating Index value shall be at least 5 percent less than the Energy Rating Index target specified in Table R406.5.

 41

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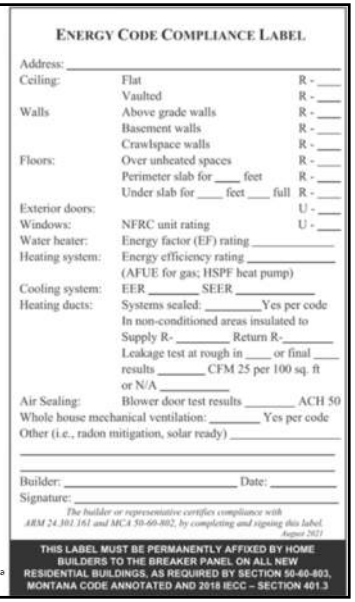
R401.3 Certificate

A permanent certificate shall be completed by the builder or other approved party and posted on a wall in the space where the furnace is located, a utility room or an approved location inside the building. Where located on an electrical panel, the certificate shall not cover or obstruct the visibility of the circuit directory label, service disconnect label or other required labels. The certificate shall indicate the following:



ENERGY CODE COMPLIANCE LABEL

Address: _____

Ceiling:	Flat	R - ___
	Vaulted	R - ___
Walls	Above grade walls	R - ___
	Basement walls	R - ___
	Crawlspace walls	R - ___
Floors:	Over unheated spaces	R - ___
	Perimeter slab for ___ feet	R - ___
	Under slab for ___ feet ___ full	R - ___
Exterior doors:		U - ___
Windows:	NFRC unit rating	U - ___
Water heater:	Energy factor (EF) rating _____	
Heating system:	Energy efficiency rating _____ (AFUE for gas; HSPF heat pump)	
Cooling system:	EER _____ SEER _____	
Heating ducts:	Systems sealed: _____Yes per code	
	In non-conditioned areas insulated to	
	Supply R- _____ Return R-_____	
	Leakage test at rough in ____ or final ____ results _____ CFM 25 per 100 sq. ft or N/A _____	
Air Sealing:	Blower door test results _____ ACH 50	

Whole house mechanical ventilation: _____ Yes per code

Other (i.e., radon mitigation, solar ready) _____

Builder: _____ Date: _____

Signature: _____

The builder or representative certifies compliance with ARM 24.301.161 and MCA 50-60-802, by completing and signing this label. August 2021

THIS LABEL MUST BE PERMANENTLY AFFIXED BY HOME BUILDERS TO THE BREAKER PANEL ON ALL NEW RESIDENTIAL BUILDINGS, AS REQUIRED BY SECTION 50-60-803, MONTANA CODE ANNOTATED AND 2018 IECC – SECTION 401.3

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R401.3 Certificate

1. The predominant R-values of insulation installed
2. U-factors of fenestration and the solar heat gain coefficient (SHGC) of fenestration
3. The results from any required duct system and building envelope air leakage testing performed on the building
4. The types, sizes and efficiencies of heating, cooling and service water-heating equipment
5. Where on-site photovoltaic panel systems have been installed, the array capacity, inverter efficiency, panel tilt and orientation shall be noted on the certificate
6. For buildings where an Energy Rating Index score is determined in accordance with Section R406, the Energy Rating Index score, both with and without any on-site generation, shall be listed on the certificate
7. The code edition under which the structure was permitted, and the compliance path used

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R402 Building Thermal Envelope

R402.1 General

The building thermal envelope shall comply with the requirements of Sections R402.1.1 through R402.1.5.

Exceptions:

1. The following low-energy buildings, or portions thereof, separated from the remainder of the building by *building thermal envelope* assemblies complying with this section shall be exempt from the building thermal envelope provisions of Section R402.

1.1. Those with a peak design rate of energy usage less than 3.4 Btu/h × ft 2 or 1.0 watt/ft2 of floor area for space-conditioning purposes.

1.2. Those that do not contain conditioned space.

2. Log homes designed in accordance with ICC 400

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R402.1.1 Vapor retarder

Wall assemblies in the building thermal envelope shall comply with the vapor retarder requirements of Section R702.7 of the International Residential Code or Section 1404.3 of the International Building Code, as applicable.

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R402 Building Thermal Envelope

R402.1.2 Insulation and fenestration criteria

The building thermal envelope shall meet the requirements of Table R402.1.2, based on the climate zone specified in Chapter 3. Assemblies shall have a U-factor equal to or less than that specified in Table R402.1.2. Fenestration shall have a U-factor and glazed fenestration SHGC equal to or less than that specified in Table R402.1.2.

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R402 Building Thermal Envelope

TABLE R402.1.2
MAXIMUM ASSEMBLY *U*-FACTORS[a] AND FENESTRATION REQUIREMENTS

CLIMATE ZONE	FENESTRATION *U*-FACTOR[f]	SKYLIGHT *U*-FACTOR	GLAZED FENESTRATION SHGC[d, e]	CEILING *U*-FACTOR	WOOD FRAME WALL *U*-FACTOR	MASS WALL *U*-FACTOR[b]	FLOOR *U*-FACTOR	BASEMENT WALL *U*-FACTOR	CRAWL SPACE WALL *U*-FACTOR
0	0.50	0.75	0.25	0.035	0.084	0.197	0.064	0.360	0.477
1	0.50	0.75	0.25	0.035	0.084	0.197	0.064	0.360	0.477
2	0.40	0.65	0.25	0.026	0.084	0.165	0.064	0.360	0.477
3	0.30	0.55	0.25	0.026	0.060	0.098	0.047	0.091[c]	0.136
4 except Marine	0.30	0.55	0.40	0.024	0.045	0.098	0.047	0.059	0.065
5 and Marine 4	0.30	0.55	0.40	0.024	0.045	0.082	0.033	0.050	0.055
6	0.30	0.55	NR	0.024	0.045	0.060	0.033	0.050	0.055
7 and 8	0.30	0.55	NR	0.024	0.045	0.057	0.028	0.050	0.055

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Montana Amendment

(c) Table R402.1.2, INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT, is amending requirements for climate zone 6 as WOOD FRAMED WALL R-VALUE 'R-21 or R-20 + R-5ci or R-13 + R-10ci or R-15ci.'

(d) Table R402.1.4, EQUIVALENT *U*-FACTORS, is amending requirements as shown below in the table:

Climate Zone	Fenestration *U-Factor*	Sky-light *U*-Factor	Ceiling *U*-Factor	Frame Wall *U*-Factor	Mass Wall *U*-Factor	Floor *U*-Factor	Basement Wall *U*-Factor	Crawl Space Wall *U*-Factor
6	0.30	0.55	0.026	0.045	0.060	0.033	0.050	0.055

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R402 Building Thermal Envelope

a. Nonfenestration U-factors shall be obtained from measurement, calculation or an approved source.

b. Mass walls shall be in accordance with Section R402.2.5. Where more than half the insulation is on the interior, the mass wall U-factors shall not exceed 0.17 in Climate Zones 0 and 1, 0.14 in Climate Zone 2, 0.12 in Climate Zone 3, 0.087 in Climate Zone 4 except Marine, 0.065 in Climate Zone 5 and Marine 4, and 0.057 in Climate Zones 6 through 8.

c. In Warm Humid locations as defined by Figure R301.1 and Table R301.1, the basement wall U-factor shall not exceed 0.360.

d. The SHGC column applies to all glazed fenestration.

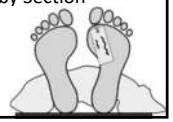
Exception: In Climate Zones 0 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.

e. There are no SHGC requirements in the Marine Zone.

f. A maximum U-factor of 0.32 shall apply in Marine Climate Zone 4 and Climate Zones 5 through 8 to vertical fenestration products installed in buildings located either:

1. Above 4,000 feet in elevation above sea level, or

2. In windborne debris regions where protection of openings is required by Section R301.2.1.2 of the International Residential Code.



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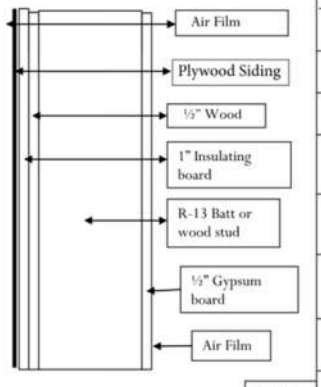
R402 Building Thermal Envelope



	R-value at Insulation	R-value at Stud
Air Film	00.17	00.17
Plywood Siding	00.59	00.59
½" Wood	00.81	00.81
1" Insulating board	03.57	03.57
R-13 Batt or wood stud	13.00	04.55
½" Gypsum board	00.45	00.45
Air Film	00.68	00.68
Totals	19.27	10.82

Assume a framing factor of 20% (The area of the wall that is wood)

Average R= (0.80 x 19.27) + (0.20 x 10.82) = 15.41 + 2.16 = 17.57

U-value = 1/17.57 = 0.057

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R402 Building Thermal Envelope

R402.1.3 R-value alternative

Assemblies with R-value of insulation materials equal to or greater than that specified in Table R402.1.3 shall be an alternative to the U-factor in Table R402.1.2

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R402 Building Thermal Envelope

TABLE R402.1.3
INSULATION MINIMUM *R*-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	FENESTRATION *U*-FACTOR[b, j]	SKYLIGHT[b] *U*-FACTOR	GLAZED FENESTRATION SHGC[b, e]	CEILING *R*-VALUE	WOOD FRAME WALL *R*-VALUE[g]	MASS WALL *R*-VALUE[h]	FLOOR *R*-VALUE	BASEMENT[c, g] WALL *R*-VALUE	SLAB[d] *R*-VALUE & DEPTH	CRAWL SPACE[c, g] WALL *R*-VALUE
0	NR	0.75	0.25	30	13 or 0&10ci	3/4	13	0	0	0
1	NR	0.75	0.25	30	13 or 0&10ci	3/4	13	0	0	0
2	0.40	0.65	0.25	49	13 or 0&10ci	4/6	13	0	0	0
3	.30	0.55	0.25	49	20 or 13&5ci[i] or 0&15ci[i]	8/13	19	5ci or 13[f]	10ci, 2 ft	5ci or 13[f]
4 except Marine	.30	0.55	0.40	60	30 or 20&5ci[i] or 13&10ci[i] or 0&20ci[i]	8/13	19	10ci or 13	10ci, 4 ft	10ci or 13
5 and Marine 4	0.30[f]	0.55	0.40	60	30 or 20&5ci[i] or 13&10ci[i] or 0&20ci[i]	13/17	30	15ci or 19 or 13&5ci	10ci, 4 ft	15ci or 19 or 13&5ci
6	0.30[f]	0.55	NR	60	30 or 20&5ci[i] or 13&10ci[i] or 0&20ci[i]	15/20	30	15ci or 19 or 13&5ci	10ci, 4 ft	15ci or 19 or 13&5ci
7 and 8	0.30[f]	0.55	NR	60	30 or 20&5ci[i] or 13&10ci[i] or 0&20ci[i]	19/21	38	15ci or 19 or 13&5ci	10ci, 4 ft	15ci or 19 or 13&5ci

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R402 Building Thermal Envelope

NR = Not Required. ci = continuous insulation.

a. R-values are minimums. U-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed R-value of the insulation shall be not less than the R-value specified in the table.

b. The fenestration U-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

Exception: In Climate Zones 0 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.

c. "5ci or 13" means R-5 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "10ci or 13" means R-10 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "15ci or 19 or 13&5ci" means R-15 continuous insulation (ci) on the interior or exterior surface of the wall; or R-19 cavity insulation on the interior side of the wall; or R-13 cavity insulation on the interior of the wall in addition to R-5 continuous insulation on the interior or exterior surface of the wall.

d. R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation R-value for slabs. as indicated in the table. The slab-edge insulation for heated slabs shall not be required to extend below the slab.

e. There are no SHGC requirements in the Marine Zone.

f. Basement wall insulation is not required in Warm Humid locations as defined by Figure R301.1 and Table R301.1.

g. The first value is cavity insulation; the second value is continuous insulation. Therefore, as an example, "13&5" means R-13 cavity insulation plus R-5 continuous insulation.

h. Mass walls shall be in accordance with Section R402.2.5. The second R-value applies where more than half of the insulation is on the interior of the mass wall.

i. A maximum U-factor of 0.32 shall apply in Climate Zones 3 through 8 to vertical fenestration products installed in buildings located either:

1. Above 4,000 feet in elevation, or

2. In windborne debris regions where protection of openings is required by Section R301.2.1.2 of the International Residential Code.

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R402.1.4 R-value computation

Cavity insulation alone shall be used to determine compliance with the cavity insulation R-value requirements in Table R402.1.3.

Where cavity insulation is installed in multiple layers, the R-values of the cavity insulation layers shall be summed to determine compliance with the cavity insulation R-value requirements.

The manufacturer's settled R-value shall be used for blown-in insulation.

Continuous insulation (ci) alone shall be used to determine compliance with the continuous insulation R-value requirements in Table R402.1.3. Where continuous insulation is installed in multiple layers, the R-values of the continuous insulation layers shall be summed to determine compliance with the continuous insulation R-value requirements.

Cavity insulation R-values shall not be used to determine compliance with the continuous insulation R-value requirements in Table R402.1.3.

Computed R-values shall not include an R-value for other building materials or air films.

Where insulated siding is used for the purpose of complying with the continuous insulation requirements of Table R402.1.3, the manufacturer's labeled R-value for the insulated siding shall be reduced by R-0.6

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R402.1.5 Total UA alternative

Where the total building thermal envelope UA, the sum of U-factor times assembly area, is less than or equal to the total UA resulting from multiplying the U-factors in Table R402.1.2 by the same assembly area as in the proposed building, the building shall be considered to be in compliance with Table R402.1.2. The UA calculation shall be performed using a method consistent with the ASHRAE Handbook of Fundamentals and shall include the thermal bridging effects of framing materials. In addition to UA compliance, the SHGC requirements of Table R402.1.2 and the maximum fenestration U-factors of Section R402.5 shall be met

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R402.2 Specific insulation requirements

R402.2.1 Ceilings with attics

Where Section R402.1.3 requires R-49 insulation in the ceiling or attic, installing R-38 over 100 percent of the ceiling or attic area requiring insulation shall satisfy the requirement for R-49 insulation wherever the full height of uncompressed R-38 insulation extends over the wall top plate at the eaves.

Where Section R402.1.3 requires R-60 insulation in the ceiling or attic, installing R-49 over 100 percent of the ceiling or attic area requiring insulation shall satisfy the requirement for R-60 insulation wherever the full height of uncompressed R-49 insulation extends over the wall top plate at the eaves.

This reduction shall not apply to the insulation and fenestration criteria in Section R402.1.2 and the Total UA alternative in Section R402.1.5

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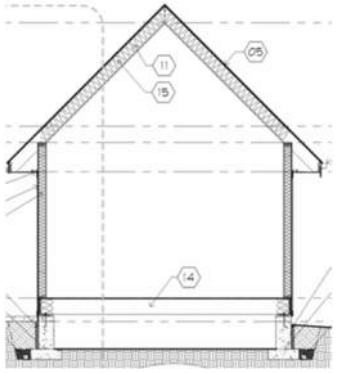
R402.2 Specific insulation requirements



R402.2.2 Ceilings without attics

Where Section R402.1.3 requires insulation R-values greater than R-30 in the interstitial space above a ceiling and below the structural roof deck, and the design of the roof/ceiling assembly does not allow sufficient space for the required insulation, the minimum required insulation R-value for such roof/ceiling assemblies shall be R-30. Insulation shall extend over the top of the wall plate to the outer edge of such plate and shall not be compressed. This reduction of insulation from the requirements of Section R402.1.3 shall be limited to 500 square feet or 20 percent of the total insulated ceiling area, whichever is less.

This reduction shall not apply to the Total UA alternative in Section R402.1.5.

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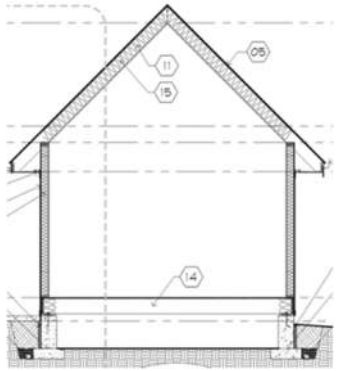
Montana Amendment

(e) Subsection R402.2.2, Ceilings Without Attics, is deleted and replaced with the following: "Where Table R402.1.3 would require insulation levels above R-30 and the design of the roof/ceiling assembly does not allow sufficient space for the required insulation, the minimum required insulation for such roof/ceiling assemblies shall be R-30. This reduction of insulation from the requirements of Table R402.1.3, shall be limited to 250 square feet or ten percent of the total insulated ceiling area, whichever is less. This reduction shall not apply to the U-factor alternative approach in Section R402.1.4, and the total UA alternative in Section R402.1.5."



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R402.2 Specific insulation requirements

R402.2.3 Eave baffle

For air-permeable insulation in vented attics, a baffle shall be installed adjacent to soffit and eave vents. Baffles shall maintain a net free area opening equal to or greater than the size of the vent. The baffle shall extend over the top of the attic insulation. The baffle shall be permitted to be any solid material. The baffle shall be installed to the outer edge of the exterior wall top plate so as to provide maximum space for attic insulation coverage over the top plate.

Where soffit venting is not continuous, baffles shall be installed continuously to prevent ventilation air in the eave soffit from bypassing the baffle

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R402.2 Specific insulation requirements

R402.2.4 Access hatches and doors

Access hatches and doors from conditioned to unconditioned spaces such as attics and crawl spaces shall be insulated to the same R-value required by Table R402.1.3 for the wall or ceiling in which they are installed

Exceptions:

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R402.2 Specific insulation requirements

R402.2.4 Access hatches and doors

Exceptions:

1.Vertical doors providing access from conditioned spaces to unconditioned spaces that comply with the fenestration requirements of Table R402.1.3 based on the applicable climate zone specified in Chapter 3.

2.Horizontal pull-down, stair-type access hatches in ceiling assemblies that provide access from conditioned to unconditioned spaces in Climate Zones 0 through 4 shall not be required to comply with the insulation level of the surrounding surfaces provided the hatch meets all of the following:

2.1.The average U-factor of the hatch shall be less than or equal to U-0.10 or have an average insulation R-value of R-10 or greater.

2.2.Not less than 75 percent of the panel area shall have an insulation R-value of R-13 or greater.

2.3.The net area of the framed opening shall be less than or equal to 13.5 square feet (1.25 m2).

2.4.The perimeter of the hatch edge shall be weatherstripped.

The reduction shall not apply to the total UA alternative in Section R402.1.5.

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R402.2 Specific insulation requirements

R402.2.4.1 Access hatches and door insulation installation and retention

Vertical or horizontal access hatches and doors

from conditioned spaces to unconditioned spaces such as attics and crawl spaces shall be weatherstripped.

Access that prevents damaging or compressing

the insulation shall be provided to all equipment.

Where loose-fill insulation is installed, a wood-framed or equivalent baffle, retainer, or dam shall be installed to prevent loose-fill insulation from spilling into living space from higher to lower sections of the attic and from attics covering conditioned spaces to unconditioned spaces. The baffle or retainer shall provide a permanent means of maintaining the installed R-value of the loose-fill insulation

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R402.2 Specific insulation requirements

R402.2.7 Floors

Floor cavity insulation shall comply with one of the following:

1. Installation shall be installed to maintain permanent contact with the underside of the subfloor decking in accordance with manufacturer instructions to maintain required R-value or readily fill the available cavity space

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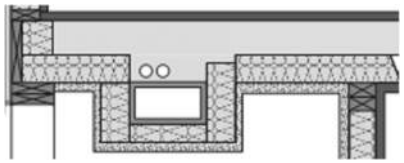
R402.2 Specific insulation requirements

2. Floor framing cavity insulation shall be permitted to be in contact with the top side of sheathing separating the cavity and the unconditioned space below. Insulation shall extend from the bottom to the top of all perimeter floor framing members and the framing members shall be air sealed



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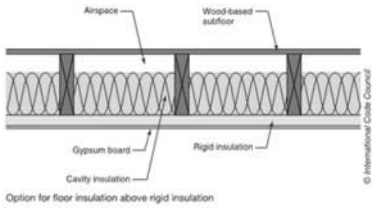
R402.2 Specific insulation requirements

3. A combination of cavity and continuous insulation shall be installed so that the cavity insulation is in contact with the top side of the continuous insulation that is installed on the underside of the floor framing separating the cavity and the unconditioned space below. The combined R-value of the cavity and continuous insulation shall equal the required R-value for floors. Insulation shall extend from the bottom to the top of all perimeter floor framing members and the framing members shall be air sealed.



Option for floor insulation above rigid insulation

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R402.2 Specific insulation requirements

R402.2.8 Basement walls
Basement walls shall be insulated in accordance with Table R402.1.3.

Exception:

Basement walls associated with unconditioned basements where all of the following requirements are met:

Exception:

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R402.2 Specific insulation requirements

R402.2.8 Basement walls

Exception: Basement walls associated with unconditioned basements where all of the following requirements are met:

1.The floor overhead, including the underside stairway stringer leading to the basement, is insulated in accordance with Section R402.1.3 and applicable provisions of Sections R402.2 and R402.2.7.

2.There are no uninsulated duct, domestic hot water, or hydronic heating surfaces exposed to the basement.

3.There are no HVAC supply or return diffusers serving the basement.

4.The walls surrounding the stairway and adjacent to conditioned space are insulated in accordance with Section R402.1.3 and applicable provisions of Section R402.2.

5.The door(s) leading to the basement from conditioned spaces are insulated in accordance with Section R402.1.3 and applicable provisions of Section R402.2, and weatherstripped in accordance with Section R402.4.

6.The building thermal envelope separating the basement from adjacent conditioned spaces complies with Section R402.4.

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R402.2 Specific insulation requirements

R402.2.8.1 Basement wall insulation installation

Where basement walls are insulated, the insulation shall be installed from the top of the basement wall down to 10 feet below grade or to the basement floor, whichever is less.

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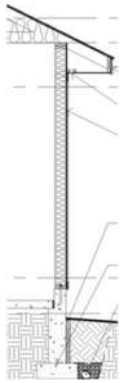
R402.2 Specific insulation requirements

R402.2.9 Slab-on-grade floors
Slab-on-grade floors with a floor surface less than 12 inches below grade shall be insulated in accordance with Table R402.1.3.

Exception

Slab-edge insulation is not required in jurisdictions designated by the code official as having a very heavy termite infestation



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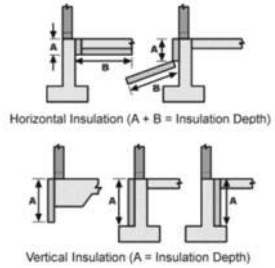
R402.2 Specific insulation requirements

R402.2.9.1 Slab-on-grade floor insulation installation

Where installed, the insulation shall extend downward from the top of the slab on the outside or inside of the foundation wall. Insulation located below grade shall be extended the distance provided in Table R402.1.3 or the distance of the proposed design, as applicable, by any combination of vertical insulation, insulation extending under the slab or insulation extending out from the building. Insulation extending away from the building shall be protected by pavement or by not less than 10 inches of soil.

The top edge of the insulation installed between the exterior wall and the edge of the interior slab shall be permitted to be cut at a 45-degree angle away from the exterior wall.



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R402.2 Specific insulation requirements

R402.2.10 Crawl space wall
Crawl space walls shall be insulated in accordance with Table R402.1.3.

Exception

Crawl space walls associated with a crawl space that is vented to the outdoors and the floor over-head is insulated in accordance with Table R402.1.3 and Section R402.2.7.

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Montana Amendment

(f) Subsection R402.2.10, Crawl Space Walls, is deleted and replaced with the following: "As an alternative to insulating floors over crawl spaces, crawl space walls shall be permitted to be insulated when the crawl space is not vented to the outside.

Temporary crawl space vent openings are allowed during construction for crawl spaces that have insulated crawl space walls.

These temporary crawl space vent openings shall be closed, sealed, and insulated to the same R-value of the surrounding crawl space wall insulation once construction is complete and prior to the time that the final building inspection would occur.

Crawl space wall insulation shall be permanently fastened to the wall and shall extend downward from the floor, the entire height of the crawl space wall.

Exposed earth in unvented crawl space foundations shall be covered with a continuous Class I vapor retarder.

All joints of the vapor retarder shall overlap six inches and be sealed or taped.

The edges of the vapor retarder shall extend at least six inches up the stem wall and shall be attached and sealed to the stem wall."

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R402.2 Specific insulation requirements

R402.2.10.1 Crawl space wall insulation installations

Where crawl space wall insulation is installed, it shall be permanently fastened to the wall and shall extend downward from the floor to the finished grade elevation and then vertically or horizontally for not less than an additional 24 inches.

Exposed earth in unvented crawl space foundations shall be covered with a continuous Class I vapor retarder in accordance with the International Building Code or International Residential Code, as applicable.

Joints of the vapor retarder shall overlap by 6 inches and be sealed or taped. The edges of the vapor retarder shall extend not less than 6 inches up stem walls and shall be attached to the stem walls.

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R402.2 Specific insulation requirements

R402.2.12 Sunroom and heated garage insulation

Sunrooms enclosing conditioned space and heated garages shall meet the insulation requirements of this code.

Exception

For sunrooms and heated garages provided thermal isolation, and enclosed conditioned space, the following exceptions to the insulation requirements of this code shall apply:

1. The minimum ceiling insulation R-values shall be R-19 in Climate Zones 0 through 4 and R-24 in Climate Zones 5 through 8.

2. The minimum wall insulation R-value shall be R-13 in all climate zones. Walls separating a sunroom or heated garage with thermal isolation from conditioned space shall comply with the building thermal envelope requirements of this code.

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R402.3 Fenestration

- **R402.3.1 U-factor**
- An area-weighted average of fenestration products shall be permitted to satisfy the U-factor requirements.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Item	#1 Value		#1 Area		#2 Value		#2 Area		#3 Value		#3 Area		Total Area		Weighted Average Value
2	Window U-Value	0.31	x	100	+	0.41	x	100	+	0.32	x	100	+	300	=	0.35
3																
4																

 75

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R402.3 Fenestration

R402.3.2 Glazed fenestration SHGC
An area-weighted average of fenestration products more than 50-percent glazed shall be permitted to satisfy the SHGC requirements.

Dynamic glazing shall be permitted to satisfy the SHGC requirements of Table R402.1.2 provided that the ratio of the higher to lower labeled SHGC is greater than or equal to 2.4, and the dynamic glazing is automatically controlled to modulate the amount of solar gain into the space in multiple steps. Dynamic glazing shall be considered separately from other fenestration, and area-weighted averaging with other fenestration that is not dynamic glazing shall be prohibited.

Exception: Dynamic glazing shall not be required to comply with this section where both the lower and higher labeled SHGC comply with the requirements of Table R402.1.2.

 76

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R402.3 Fenestration

R402.3.3 Glazed fenestration exemption

Not greater than 15 square feet of glazed fenestration per dwelling unit shall be exempt from the U-factor and SHGC requirements in Section R402.1.2.

This exemption shall not apply to the Total UA alternative in Section R402.1.5.

 77

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R402.3 Fenestration

R402.3.4 Opaque door exemption

One side-hinged opaque door assembly not greater than 24 square feet in area shall be exempt from the U-factor requirement in Section R402.1.2.

This exemption shall not apply to the Total UA alternative in Section R402.1.5.

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R402.3 Fenestration

R402.3.5 Sunroom and heated garage fenestration

Sunrooms and heated garages enclosing conditioned space shall comply with the fenestration requirements of this code.

Exception

In Climate Zones 2 through 8, for sunrooms and heated garages with thermal isolation and enclosing conditioned space, the fenestration U-factor shall not exceed 0.45 and the skylight U-factor shall not exceed 0.70.

New fenestration separating a sunroom or heated garage with thermal isolation from conditioned space shall comply with the building thermal envelope requirements of this code.

 79

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R402.4 Air leakage

R402.4 Air leakage

The building thermal envelope shall be constructed to limit air leakage in accordance with the requirements of Sections R402.4.1 through R402.4.5.

R402.4.1 Building thermal envelope

The building thermal envelope shall comply with Sections R402.4.1.1 through R402.4.1.3. The sealing methods between dissimilar materials shall allow for differential expansion and contraction.

 80

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R402.4 Air leakage

R402.4.1.1 Installation

The components of the building thermal envelope as indicated in Table R402.4.1.1 shall be installed in accordance with the manufacturer's instructions and the criteria indicated in Table R402.4.1.1, as applicable to the method of construction.

Where required by the code official, an approved third party shall inspect all components and verify compliance.

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R402.4 Air leakage

TABLE R402.4.1.1
AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION [a]

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building envelope. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.

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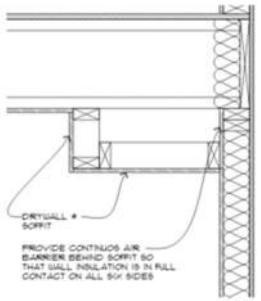
TABLE R402.4.1.1
AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION [a]

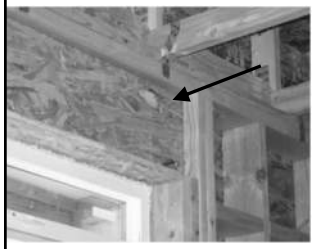
COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
Ceiling/attic	The air barrier in any dropped ceiling or soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be sealed.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.



83

TABLE R402.4.1.1
AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION [a]

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance, R-value, of not less than R-3 per inch. Exterior thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier.



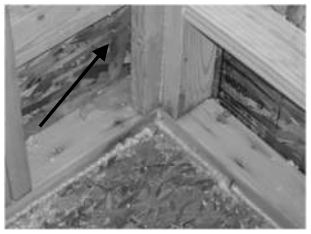


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TABLE R402.4.1.1
AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION [a]

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
Windows, skylights and doors	The space between framing and skylights, and the jambs of windows and doors, shall be sealed.	—

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TABLE R402.4.1.1
AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION [a]

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
Rim joists	Rim joists shall include an exterior air barrier.[b] The junctions of the rim board to the sill plate and the rim board and the subfloor shall be air sealed.	Rim joists shall be insulated so that the insulation maintains permanent contact with the exterior rim board.[b]

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TABLE R402.4.1.1
AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION [a]

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
Floors, including cantilevered floors and floors above garages	The air barrier shall be installed at any exposed edge of insulation.	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking. Alternatively, floor framing cavity insulation shall be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing and extending from the bottom to the top of all perimeter floor framing members.

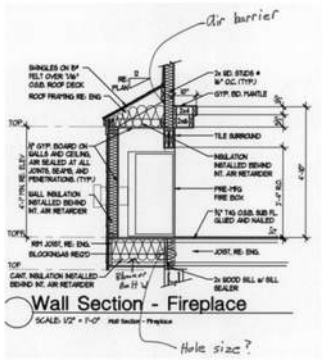

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TABLE R402.4.1.1
AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION [a]

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
Basement crawl space and slab foundations	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder/air barrier in accordance with Section R402.2.10. Penetrations through concrete foundation walls and slabs shall be air sealed. Class 1 vapor retarders shall not be used as an air barrier on below-grade walls and shall be installed in accordance with Section R702.7 of the International Residential Code.	Crawl space insulation, where provided instead of floor insulation, shall be installed in accordance with Section R402.2.10. Conditioned basement foundation wall insulation shall be installed in accordance with Section R402.2.8.1. Slab-on-grade floor insulation shall be installed in accordance with Section R402.2.10.

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TABLE R402.4.1.1
AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION [a]

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
Shafts, penetrations	Duct and flue shafts to exterior or unconditioned space shall be sealed. Utility penetrations of the air barrier shall be caulked, gasketed or otherwise sealed and shall allow for expansion, contraction of materials and mechanical vibration.	Insulation shall be fitted tightly around utilities passing through shafts and penetrations in the building thermal envelope to maintain required R-value.

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TABLE R402.4.1.1
AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION [a]

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
Narrow cavities	Narrow cavities of 1 inch or less that are not able to be insulated shall be air sealed.	Batts to be installed in narrow cavities shall be cut to fit or narrow cavities shall be filled with insulation that on installation readily conforms to the available cavity space.

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TABLE R402.4.1.1
AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION [a]

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	Insulated portions of the garage separation assembly shall be installed in accordance with Sections R303 and R402.2.7.

91

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TABLE R402.4.1.1
AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION [a]

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be air sealed in accordance with Section R402.4.5.	Recessed light fixtures installed in the building thermal envelope shall be airtight and IC rated, and shall be buried or surrounded with insulation.

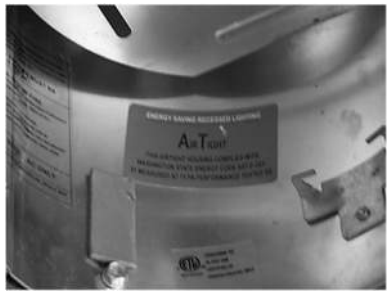

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TABLE R402.4.1.1
AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION [a]

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
Plumbing, wiring or other obstructions	All holes created by wiring, plumbing or other obstructions in the air barrier assembly shall be air sealed.	Insulation shall be installed to fill the available space and surround wiring, plumbing, or other obstructions, unless the required R-value can be met by installing insulation and air barrier systems completely to the exterior side of the obstructions.

93

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TABLE R402.4.1.1
AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION [a]

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
Shower/tub on exterior wall	The air barrier installed at exterior walls adjacent to showers and tubs shall separate the wall from the shower or tub.	Exterior walls adjacent to showers and tubs shall be insulated.

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TABLE R402.4.1.1
AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION [a]

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical and communication boxes. **Alternatively**, air-sealed boxes shall be installed.	—

95

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TABLE R402.4.1.1
AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION [a]

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
HVAC register boots	HVAC supply and return register boots that penetrate building thermal envelope shall be sealed to the subfloor, wall covering or ceiling penetrated by the boot.	—

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TABLE R402.4.1.1
AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION [a]

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
Concealed sprinklers	Where required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.	—

a. Inspection of log walls shall be in accordance with the provisions of ICC 400.
b. Air barrier and insulation full enclosure is not required in unconditioned/ventilated attic spaces and at rim joists.

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R402.4 Air leakage

R402.4.1.2 Testing

The building or dwelling unit shall be tested for air leakage. The maximum air leak-age rate for any building or dwelling unit under any compliance path shall not exceed 5.0 air changes per hour **or** 0.28 cubic feet per minute (CFM) per square foot of dwelling unit enclosure area. Testing shall be conducted in accordance with ANSI/RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals)

Exception….

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R402.4 Air leakage

Exception

For heated, attached private garages and heated, detached private garages accessory to one-and two-family dwellings and townhouses not more than three stories above grade plane in height, building envelope tightness and insulation installation shall be considered acceptable where the items in Table R402.4.1.1, applicable to the method of construction, are field verified.

Where required by the code official, an approved third party independent from the installer shall inspect both air barrier and insulation installation criteria. Heated, attached private garage space and heated, detached private garage space shall be thermally isolated from all other habitable, conditioned spaces in accordance with Sections R402.2.12 and R402.3.5, as applicable

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R402.4 Air leakage

During testing

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weatherstripping or other infiltration control measures.
2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures.
3. Interior doors, where installed at the time of the test, shall be open.
4. Exterior or interior terminations for continuous ventilation systems shall be sealed.
5. Heating and cooling systems, where installed at the time of the test, shall be turned off.
6. Supply and return registers, where installed at the time of the test, shall be fully open.

Exception

When testing individual dwelling units, an air leakage rate not exceeding 0.30 cubic feet per minute per square foot of the dwelling unit enclosure area, tested in accordance with ANSI/RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure o0.2 inch w.g. (50 Pa), shall be permitted in all climate zones for:

1. Attached single and multiple-family building dwelling units.
2. Buildings or dwelling units that are 1,500 square feet or smaller.

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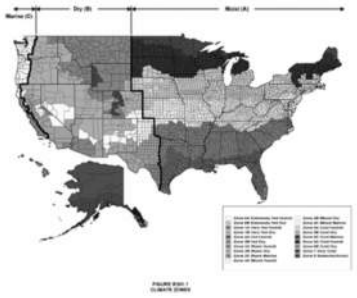
R402.4 Air leakage

R402.4.1.3 Leakage rate

When complying with Section R401.2.1, the building or dwelling unit shall have an air leakage rate not exceeding 5.0 air changes per hour in Climate Zones 0, 1 and 2, **and** 3.0 air changes per hour in Climate Zones 3 through 8, when tested in accordance with Section R402.4.1.2.



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Montana Amendment

(g) Subsection R402.4.1.2, Testing, is deleted and replaced with the following: The building or dwelling unit shall be tested and verified as having an air leakage rate of not exceeding four air changes per hour in Climate Zone 6. Testing shall be conducted with a blower door at a pressure of 0.2 inches w.g. (50 Pascals).
Where required by the code official, testing shall be conducted by an approved party. A written report of the results of the test shall be signed by the party conducting the test and provided to the code official. Testing shall be performed at any time after creation of all penetrations of the building thermal envelope.
During testing:
"(i) exterior windows and doors, fireplace and stove doors shall be closed, but not sealed;
"(ii) dampers shall be closed, but not sealed, including exhaust, intake, makeup air, back draft and flue
dampers;
"(iii) interior doors shall be open;
"(iv) exterior openings for continuous ventilation systems and heat recovery ventilators shall be closed and sealed;
"(v) heating and cooling system(s) shall be turned off;
"(vi) "B" or "L" vents, combustion air vents, and dryer vents shall be sealed; and
"(vii) supply and return registers, where installed at the time of test, shall by fully open.

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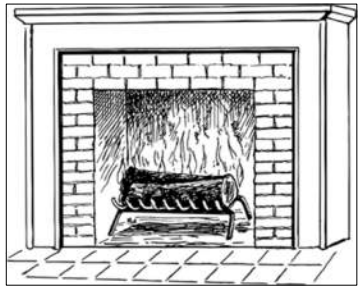
R402.4 Air leakage

R402.4.2 Fireplaces

New wood-burning fireplaces shall have tight-fitting flue dampers or doors, and outdoor combustion air. Where using tight-fitting doors on factory-built fireplaces listed and labeled in accordance with UL 127, the doors shall be tested and listed for the fireplace.



 103

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R402.4 Air leakage

R402.4.3 Fenestration air leakage

Windows, skylights and sliding glass doors shall have an air infiltration rate of not greater than 0.3 cfm per square foot, and for swinging doors, not greater than 0.5 cfm per square foot, when tested in accordance with NFRC 400 or AAMA/WDMA/CSA 101/I.S.2/A440 by an accredited, independent laboratory and listed and labeled by the manufacturer

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R402.4 Air leakage

R402.4.4 Rooms containing fuel-burning appliances

In Climate Zones 3 through 8, where open combustion air ducts provide combustion air to open combustion fuel burning appliances, the appliances and combustion air opening shall be located outside the building thermal envelope or enclosed in a room, isolated from inside the thermal envelope. Such rooms shall be sealed and insulated in accordance with the envelope requirements of Table R402.1.2, where the walls, floors and ceilings shall meet not less than the basement wall R-value requirement. The door into the room shall be fully gasketed and any water lines and ducts in the room insulated in accordance with Section R403. The combustion air duct shall be insulated where it passes through conditioned space to a minimum of R-8.

 105

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R402.4 Air leakage

R402.4.5 Recessed lighting

Recessed luminaires installed in the building thermal envelope shall be sealed to limit air leakage between conditioned and unconditioned spaces. Recessed luminaires shall be IC-rated and labeled as having an air leakage rate of not greater than 2.0 cfm when tested in accordance with ASTM E283 at a pressure differential of 1.57 psf.

Recessed luminaires shall be sealed with a gasket or caulked between the housing and the interior wall or ceiling covering

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R402.4.6 Electrical and communication outlet boxes (air-sealed boxes)

R402.4 Air leakage

Electrical and communication outlet boxes installed in the building thermal envelope shall be sealed to limit air leakage between conditioned and unconditioned spaces. Electrical and communication outlet boxes shall be tested in accordance with NEMA OS 4 , Requirements for Air-Sealed Boxes for Electrical and Communication Applications, and shall have an air leak-age rate of not greater than 2.0 cubic feet per minute at a pressure differential of 1.57 psf (75 Pa).

Electrical and communication outlet boxes shall be marked “NEMA OS 4” or “OS 4” in accordance with NEMA OS 4.

Electrical and communication outlet boxes shall be installed per the manufacturer’s instructions and with any supplied components required to achieve compliance with NEMA OS 4

 107

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R403.1 Controls

R403.1.1 Programmable thermostat

The thermostat controlling the primary heating or cooling system of the dwelling unit shall be capable of controlling the heating and cooling system on a daily schedule to maintain different temperature set points at different times of day and different days of the week.

This thermostat shall include the capability to set back or temporarily operate the system to maintain zone temperatures of not less than 55°F to not greater than 85°F.

The thermostat shall be programmed initially by the manufacturer with a heating temperature setpoint of not greater than 70°F and a cooling temperature setpoint of not less than 78°F

 108

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R403.1 Controls

R403.1.2 Heat pump supplementary heat

Heat pumps having supplementary electric-resistance heat shall have controls that, except during defrost, prevent supplemental heat operation when the heat pump compressor can meet the heating load

 109

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R403.1 Controls

R403.2 Hot water boiler temperature reset

The manufacturer shall equip each gas, oil and electric boiler (other than a boiler equipped with a tankless domestic water heating coil) with automatic means of adjusting the water temperature supplied by the boiler to ensure incremental change of the inferred heat load will cause an incremental change in the temperature of the water supplied by the boiler. This can be accomplished with outdoor reset, indoor reset or water temperature sensing.

 110

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R403.3 Ducts

R403.3.1 Ducts located outside conditioned space

Supply and return ducts located outside conditioned space shall be insulated to an R-value of not less than R-8 for ducts 3 inches in diameter and larger and not less than R-6 for ducts smaller than 3 inches in diameter.

Ducts buried beneath a building shall be insulated as required per this section or have an equivalent thermal distribution efficiency.

Underground ducts utilizing the thermal distribution efficiency method shall be listed and labeled to indicate the R-value equivalency.

 111

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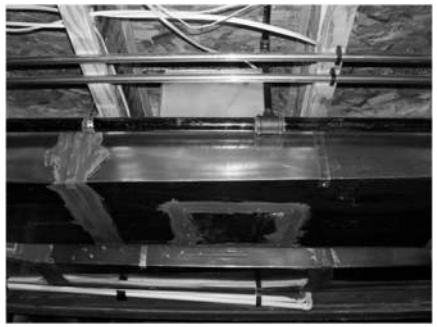
R403.3 Ducts

R403.3.2 Ducts located in conditioned space

For ductwork to be considered inside a conditioned space, it shall comply with one of the following:

1. The duct system shall be located completely within the continuous air barrier and within the building thermal envelope.



 112

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R403.3 Ducts

2. Ductwork in ventilated attic spaces shall be buried within ceiling insulation in accordance with Section R403.3.3 and all of the following conditions shall exist:

2.1. The air handler is located completely within the continuous air barrier and within the building thermal envelope.

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R403.3 Ducts

2.2. The duct leakage, as measured either by a rough-in test of the ducts or a post-construction total system leakage test to outside the building thermal envelope in accordance with Section R403.3.6, is less than or equal to 1.5 cubic feet per minute per 100 square feet of conditioned floor area served by the duct system.

2.3. The ceiling insulation R-value installed against and above the insulated duct is greater than or equal to the proposed ceiling insulation R-value, less the R-value of the insulation on the duct.

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R403.3 Ducts

3. Ductwork in floor cavities located over unconditioned space shall comply with all of the following:

3.1. A continuous air barrier installed between unconditioned space and the duct.

3.2. Insulation installed in accordance with Section R402.2.7.

3.3. A minimum R-19 insulation installed in the cavity width separating the duct from unconditioned space.

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R403.3 Ducts

4. Ductwork located within exterior walls of the building thermal envelope shall comply with the following:

4.1. A continuous air barrier installed between unconditioned space and the duct.

4.2. Minimum R-10 insulation installed in the cavity width separating the duct from the outside sheathing.

4.3. The remainder of the cavity insulation shall be fully insulated to the drywall side.

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R403.3 Ducts

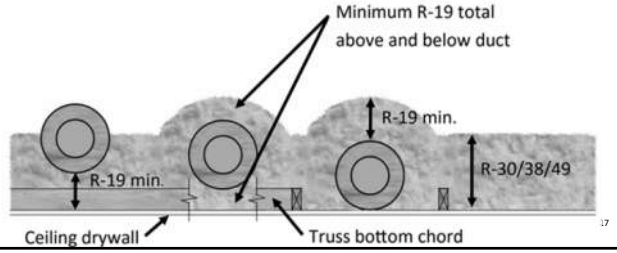
R403.3.3 Ducts buried within ceiling insulation

Where supply and return air ducts are partially or completely buried in ceiling insulation, such ducts shall comply with all of the following:

1. The supply and return ducts shall have an insulation R-value not less than R-8.

2. At all points along each duct, the sum of the ceiling insulation R-value against and above the top of the duct, and against and below the bottom of the duct, shall be not less than R-19, excluding the R-value of the duct insulation.

3. In Climate Zones 0A, 1A, 2A and 3A, the supply ducts shall be completely buried within ceiling insulation, insulated to an R-value of not less than R-13 and in compliance with the vapor retarder requirements of Section 604.11 of the International Mechanical Code or Section M1601.4.6 of the International Residential Code, as applicable.



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R403.3 Ducts

R403.3.4 Sealing

Ducts, air handlers and filter boxes shall be sealed. Joints and seams shall comply with either the International Mechanical Code or International Residential Code, as applicable.

 118

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R403.3.4.1 Sealed air handler

Air handlers shall have a manufacturer's designation for an air leakage of not greater than 2 percent of the design airflow rate when tested in accordance with ASHRAE 193.

 119

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R403.3 Ducts

R403.3.5 Duct testing

Ducts shall be pressure tested in accordance with ANSI/RESNET/ICC 380 or ASTM E1554 to determine air leakage by one of the following methods:

1. Rough-in test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the system, including the manufacturer's air handler enclosure if installed at the time of the test. Registers shall be taped or otherwise sealed during the test.

2. Postconstruction test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. Registers shall be taped or otherwise sealed during the test.

Exception: A duct air-leakage test shall not be required for ducts serving ventilation systems that are not integrated with ducts serving heating or cooling systems

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R403.3 Ducts

R403.3.6 Duct leakage

The total leakage of the ducts, where measured in accordance with Section R403.3.5, shall be as follows:

1. Rough-in test: The total leakage shall be less than or equal to 4.0 cubic feet per minute per 100 square feet of conditioned floor area where the air handler is installed at the time of the test. Where the air handler is not installed at the time of the test, the total leakage shall be less than or equal to 3.0 cubic feet per minute per 100 square feet of conditioned floor area.

2. Postconstruction test: Total leakage shall be less than or equal to 4.0 cubic feet per minute per 100 square feet of conditioned floor area.

3. Test for ducts within thermal envelope: Where all ducts and air handlers are located entirely within the building thermal envelope, total leakage shall be less than or equal to 8.0 cubic feet per minute per 100 square feet of conditioned floor area.

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R403.3 Ducts

R403.3.7 Building cavities

Building framing cavities shall not be used as ducts or plenums.

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Montana Amendment

(i) Subsection R403.3.7,
Exception: Building framing cavities may be used for return ducts if there is no atmospherically vented furnace, boiler, or water heater located in the house outside of a sealed and insulated room that is isolated from inside the thermal envelope and if the duct system has been tested as having a maximum total leakage not greater than 4 cfm/(100?)SF. The room walls, floor, and ceilings shall be insulated in accordance with the basement wall requirements of Table R402.1.3. A duct air leakage test shall not be required where the ducts and air handlers are located entirely within the building thermal envelope.

 123

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R403.4 Mechanical system piping insulation

Mechanical system piping capable of carrying fluids greater than 105°F or less than 55°F shall be insulated to an R-value of not less than R-3

 124

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R403.5 Service hot water systems

R403.5.1 Heated water circulation and temperature maintenance systems

Heated water circulation systems shall be in accordance with Section R403.5.1.1. Heat trace temperature maintenance systems shall be in accordance with Section R403.5.1.2. Automatic controls, temperature sensors and pumps shall be in a location with access. Manual controls shall be in a location with ready access

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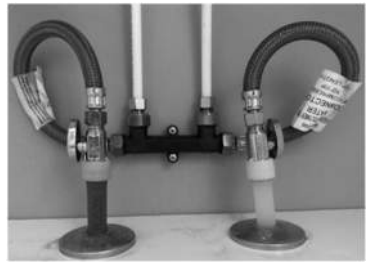
R403.5 Service hot water systems

R403.5.1.1 Circulation systems

Heated water circulation systems shall be provided with a circulation pump. The system return pipe shall be a dedicated return pipe or a cold water supply pipe. Gravity and thermosyphon circulation systems shall be prohibited.

Controls for circulating hot water system pumps shall automatically turn off the pump when the water in the circulation loop is at the desired temperature and when there is no demand for hot water.

The controls shall limit the temperature of the water entering the cold water piping to not greater than 104ºF .



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R403.5 Service hot water system

R403.5.1.1.1 Demand recirculation water systems

Where installed, demand recirculation water systems shall have controls that start the pump upon receiving a signal from the action of a user of a fixture or appliance, sensing the presence of a user of a fixture or sensing the flow of hot or tempered water to a fixture fitting or appliance.

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R403.5 Service hot water system

R403.5.1.2 Heat trace systems.

Electric heat trace systems shall comply with IEEE 515.1 or UL 515. Controls for such systems shall automatically adjust the energy input to the heat tracing to maintain the desired water temperature in the piping in accordance with the times when heated water is used in the occupancy.

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R403.5 Service hot water systems

R403.5.2 Hot water pipe insulation

Insulation for service hot water piping with a thermal resistance, R-value, of not less than R-3 shall be applied to the following:

1. Piping 3/4 inch (19.1 mm) and larger in nominal diameter located inside the conditioned space.
2. Piping serving more than one dwelling unit.
3. Piping located outside the conditioned space.
4. Piping from the water heater to a distribution manifold.
5. Piping located under a floor slab.
6. Buried piping.
7. Supply and return piping in circulation and recirculation systems other than cold water pipe return demand recirculation systems.

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R403.5 Service hot water systems

R403.5.3 Drain water heat recovery units

Where installed, drain water heat recovery units shall comply with CSA B55.2.

Drain water heat recovery units shall be tested in accordance with CSA B55.1. Potable water-side pressure loss of drain water heat recovery units shall be less than 3 psi for individual units connected to one or two showers.

Potable water-side pressure loss of drain water heat recovery units shall be less than 2 psi for individual units connected to three or more showers.

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R403.6 Mechanical ventilation

The buildings complying with Section R402.4.1 shall be provided with ventilation that complies with the requirements of Section M1505 of the International Residential Code or International Mechanical Code, as applicable, or with other approved means of ventilation.

Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating.

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R403.6 Mechanical ventilation

R403.6.1 Heat or energy recovery ventilation

Dwelling units shall be provided with a heat recovery or energy recovery ventilation system in Climate Zones 7 and 8.

The system shall be balanced with a minimum sensible heat recovery efficiency of 65 percent at 32°F at a flow greater than or equal to the design airflow.

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R403.6 Mechanical ventilation

R403.6.2 Whole-dwelling mechanical ventilation system fan efficacy

Fans used to provide whole-dwelling mechanical ventilation shall meet the efficacy requirements of Table R403.6.2 at one or more rating points. Fans shall be tested in accordance with HVI 916 and listed. The airflow shall be reported in the product listing or on the label.

Fan efficacy shall be reported in the product listing or shall be derived from the input power and airflow values reported in the product listing or on the label.

Fan efficacy for fully ducted HRV, ERC, balanced, and in-line fans shall be determined at a static pressure of not less than 0.2 inch w.c.

Fan efficacy for ducted range hoods, bathroom and utility room fans shall be determined at a static pressure of not less than 0.1 inch w.c.

TABLE R403.6.2
WHOLE-DWELLING MECHANICAL VENTILATION SYSTEM FAN EFFICACY[a]

FAN LOCATION	AIRFLOW RATE MINIMUM (CFM)	MINIMUM EFFICACY (CFM/WATT)
HRV, ERV	Any	1.2 cfm/watt
In-line supply or exhaust fan	Any	3.8 cfm/watt
Other exhaust fan	< 90	2.8 cfm/watt
Other exhaust fan	≥ 90	3.5 cfm/watt
Air-handler that is integrated to tested and *listed* HVAC equipment	Any	1.2 cfm/watt

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R403.6 Mechanical ventilation

R403.6.3 Testing

Mechanical ventilation systems shall be tested and verified to provide the minimum ventilation flow rates required by Section R403.6. Testing shall be performed according to the ventilation equipment manufacturer's instructions, or by using a flow hood or box, flow grid, or other airflow measuring device at the mechanical ventilation fan's inlet terminals or grilles, outlet terminals or grilles, or in the connected ventilation ducts. Where required by the code official, testing shall be conducted by an approved third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the code official.

Exception

Kitchen range hoods that are ducted to the outside with 6-inch or larger duct and not more than one 90-degree elbow or equivalent in the duct run.

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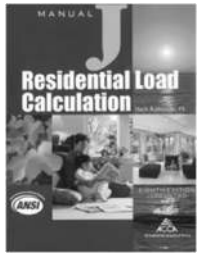
R403.7 Equipment sizing and efficiency rating

Heating and cooling equipment shall be sized in accordance with ACCA Manual S based on building loads calculated in accordance with ACCA Manual J or other approved heating and cooling calculation methodologies. New or replacement heating and cooling equipment shall have an efficiency rating equal to or greater than the minimum required by federal law for the geographic location where the equipment is installed.



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R403.8 Systems serving multiple dwelling units

Systems serving multiple dwelling units shall comply with Sections C403 and C404 of the International Energy Conservation Code—Commercial Provisions instead of Section R403

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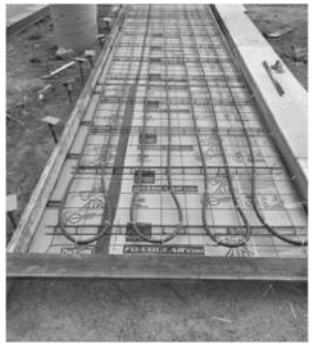
R403.9 Snow melt and ice system controls

Snow- and ice-melting systems, supplied through energy service to the building, shall include automatic controls capable of shutting off the system when the pavement temperature is greater than 50°F and precipitation is not falling, and an automatic or manual control that will allow shutoff when the outdoor temperature is greater than 40°F



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R403.10 Energy consumption of pools and spas

R403.10.1 Heaters

The electric power to heaters shall be controlled by an on-off switch that is an integral part of the heater mounted on the exterior of the heater in a location with ready access, or external to and within 3 feet of the heater. Operation of such switch shall not change the setting of the heater thermostat. Such switches shall be in addition to a circuit breaker for the power to the heater.

Gas-fired heaters shall not be equipped with continuously burning ignition pilots.

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R403.10 Energy consumption of pools and spas

R403.10.2 Time switches

Time switches or other control methods that can automatically turn heaters and pump motors off and on according to a preset schedule shall be installed for heaters and pump motors. Heaters and pump motors that have built-in time switches shall be in compliance with this section.

Exceptions

1. Where public health standards require 24-hour pump operation.

2. Pumps that operate solar- and waste-heat-recovery pool heating systems.

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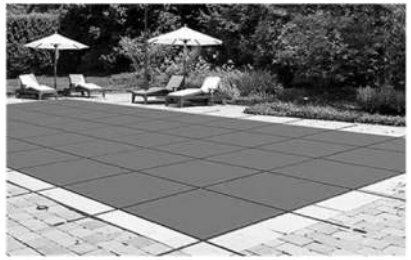
R403.10 Energy consumption of pools and spas

R403.10.3 Covers

Outdoor heated pools and outdoor permanent spas shall be provided with a vapor-retardant cover or other approved vapor-retardant means.

Exception

Where more than 75 percent of the energy for heating, computed over an operation season of not fewer than 3 calendar months, is from a heat pump or an on-site renewable energy system, covers or other vapor-retardant means shall not be required.



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R403.10 Energy consumption of pools and spas

R403.11 Portable spas

The energy consumption of electric powered portable spas shall be controlled by the requirements of APSP 14.

R403.12 Residential pools and permanent residential spas

Where installed, the energy consumption of residential swimming pools and permanent residential spas shall be controlled in accordance with the requirements of APSP 15

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R404 Electrical Power and Lighting Systems

R404.1 Lighting equipment

All permanently installed lighting fixtures, excluding kitchen appliance lighting fixtures, shall contain only high-efficacy lighting sources.

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R404 Electrical Power and Lighting Systems

R404.1.1 Exterior lighting

Connected exterior lighting for residential buildings shall comply with Section C405.5.

Exceptions:

1. Detached one- and two- family dwellings.
2. Townhouses.
3. Solar-powered lamps not connected to any electrical service.
4. Luminaires controlled by a motion sensor.
5. Lamps and luminaires that comply with Section R404.1

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R404 Electrical Power and Lighting Systems

R404.1.2 Fuel gas lighting equipment

Fuel gas lighting systems shall not have continuously burning pilot lights.

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R404 Electrical Power and Lighting Systems

R404.2 Interior lighting controls

Permanently installed lighting fixtures shall be controlled with either a dimmer, an occupant sensor control or other control that is installed or built into the fixture.

Exception

Lighting controls shall not be required for the following:

1. Bathrooms.
2. Hallways.
3. Exterior lighting fixtures.
4. Lighting designed for safety or security.

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R404 Electrical Power and Lighting Systems

R404.3 Exterior lighting controls

Where the total permanently installed exterior lighting power is greater than 30 watts, the permanently installed exterior lighting shall comply with the following:

1. Lighting shall be controlled by a manual on and off switch which permits automatic shut-off actions.

Exception

1. Lighting serving multiple dwelling units.
2. Lighting shall be automatically shut off when daylight is present and satisfies the lighting needs.
3. Controls that override automatic shut-off actions shall not be allowed unless the override automatically returns automatic control to its normal operation within 24 hours

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R405 Total Building Performance

R405.1 Scope

This section establishes criteria for compliance using total building performance analysis. Such analysis shall include heating, cooling, mechanical ventilation and service water heating energy only.

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R405 Total Building Performance

R405.2 Performance-based compliance

Compliance based on total building performance requires that a proposed design meets all of the following:

1. The requirements of the sections indicated within Table R405.2.

2. The building thermal envelope shall be greater than or equal to levels of efficiency and solar heat gain coefficients in Table R402.1.1 or R402.1.3 of the 2009 International Energy Conservation Code.

3. An annual energy cost that is less than or equal to the annual energy cost of the standard reference design. Energy prices shall be taken from a source approved by the code official, such as the Department of Energy, Energy Information Administration's State Energy Data System Prices and Expenditures reports. Code officials shall be permitted to require time-of-use pricing in energy cost calculations.

Exception

The energy use based on source energy expressed in Btu or Btu per square foot of conditioned floor area shall be permitted to be substituted for the energy cost. The source energy multiplier for electricity shall be 3.16. The source energy multiplier for fuels other than electricity shall be 1.1.

TABLE R405.2
REQUIREMENTS FOR TOTAL BUILDING PERFORMANCE

SECTION*	TITLE
General	
R401.2.5	Additional energy efficiency
R401.3	Certificate
Building Thermal Envelope	
R402.1.1	Vapor retarder
R402.2.3	Eave baffle
R402.2.4.1	Access hatches and doors
R402.2.10.1	Crawl space wall insulation installations
R402.4.1.1	Installation
R402.4.1.2	Testing
R402.5	Maximum fenestration *U*-factor and SHGC
Mechanical	
R403.1	Controls
R403.3, including R403.3.1, except Sections R403.3.2, R403.3.3 and R403.3.6	Ducts
R403.4	Mechanical system piping insulation
R403.5.1	Heated water circulation and temperature maintenance systems
R403.5.3	Drain water heat recovery units
R403.6	Mechanical ventilation
R403.7	Equipment sizing and efficiency rating
R403.8	Systems serving multiple dwelling units
R403.9	Snow melt and ice systems
R403.10	Energy consumption of pools and spas
R403.11	Portable spas
R403.12	Residential pools and permanent residential spas
Electrical Power and Lighting Systems	
R404.1	Lighting equipment
R404.2	Interior lighting controls

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R405 Total Building Performance

R405.3.2.1 Compliance report for permit application

A compliance report submitted with the application for building permit shall include the following:

1. Building street address, or other building site identification.

2. The name of the individual performing the analysis and generating the compliance report.

3. The name and version of the compliance software tool.

4. Documentation of all inputs entered into the software used to produce the results for the reference design and/or the rated home.

5. A certificate indicating that the proposed design complies with Section R405.3. The certificate shall document the building components' energy specifications that are included in the calculation including: component-level insulation R-values or U-factors; duct system and building envelope air leakage testing assumptions; and the type and rated efficiencies of proposed heating, cooling, mechanical ventilation and service water-heating equipment to be installed. If on-site renewable energy systems will be installed, the certificate shall report the type and production size of the proposed system.

6. Where a site-specific report is not generated, the proposed design shall be based on the worst-case orientation and configuration of the rated home.

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R405 Total Building Performance

R405.3.2.2 Compliance report for certificate of Occupancy

A compliance report submitted for obtaining the certificate of occupancy shall include the

following:

1. Building street address, or other building site identification.

2. Declaration of the total building performance path on the title page of the energy report and the title page of the building plans.

3. A statement, bearing the name of the individual performing the analysis and generating the report, indicating that the as-built building complies with Section R405.3.

4. The name and version of the compliance software tool.

5. A site-specific energy analysis report that is in compliance with Section R405.3.

6. A final confirmed certificate indicating compliance based on inspection, and a statement indicating that the confirmed rated design of the built home complies with Section R405.3.

The certificate shall report the energy features that were confirmed to be in the home, including component-level insulation R-values or U-factors; results from any required duct system and building envelope air leakage testing; and the type and rated efficiencies of the heating, cooling, mechanical ventilation and service water-heating equipment installed.

7. When on-site renewable energy systems have been installed, the certificate shall report the type and production size of the installed system.

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TABLE R405.4.2(1)
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Above-grade walls	Type: mass where the proposed wall is a mass wall; otherwise wood frame.	As proposed
	Gross area: same as proposed.	As proposed
	U-factor: as specified in Table R402.1.2.	As proposed
	Solar absorptance = 0.75.	As proposed
	Emittance = 0.90.	As proposed
Basement and crawl space walls	Type: same as proposed.	As proposed
	Gross area: same as proposed.	As proposed
	U-factor: as specified in Table R402.1.2, with the insulation layer on the interior side of the walls.	As proposed
Above-grade floors	Type: wood frame.	As proposed
	Gross area: same as proposed.	As proposed
	U-factor: as specified in Table R402.1.2.	As proposed
Ceilings	Type: wood frame.	As proposed
	Gross area: same as proposed.	As proposed
	U-factor: as specified in Table R402.1.2.	As proposed
Roofs	Type: composition shingle on wood sheathing.	As proposed
	Gross area: same as proposed.	As proposed
	Solar absorptance = 0.75.	As proposed
	Emittance = 0.90.	As proposed
Attics	Type: vented with an aperture of 1 ft^2 per 300 ft^2 of ceiling area.	As proposed
Foundations	Type: same as proposed.	As proposed
	Foundation wall area above and below grade and soil characteristics: same as proposed.	As proposed
Opaque doors	Area: 40 ft^2.	As proposed
	Orientation: North.	As proposed
	U-factor: same as fenestration as specified in Table R402.1.2.	As proposed

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R406 Energy Rating Index Compliance Alternative

R406.1 Scope

This section establishes criteria for compliance using an Energy Rating Index (ERI) analysis.

R406.2 ERI compliance Compliance based on the ERI requires that the rated design meets all of the following:

1. The requirements of the sections indicated within Table R406.2.

2. Maximum ERI of Table R406.5.

TABLE R406.5
MAXIMUM ENERGY RATING INDEX

CLIMATE ZONE	ENERGY RATING INDEX
0-1	52
2	52
3	51
4	54
5	55
6	54
7	53
8	53

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R406 Energy Rating Index Compliance Alternative

TABLE R406.2
REQUIREMENTS FOR ENERGY RATING INDEX

SECTION[a]	TITLE
General	
R401.2.5	Additional efficiency packages
R401.3	Certificate
Building Thermal Envelope	
R402.1.1	Vapor retarder
R402.2.3	Eave baffle
R402.2.4.1	Access hatches and doors
R402.2.10.1	Crawl space wall insulation installation
R402.4.1.1	Installation
R402.4.1.2	Testing
Mechanical	
R403.1	Controls
R403.3 except Sections R403.3.2, R403.3.3 and R403.3.6	Ducts
R403.4	Mechanical system piping insulation
R403.5.1	Heated water calculation and temperature maintenance systems
R403.5.3	Drain water heat recovery units
R403.6	Mechanical ventilation
R403.7	Equipment sizing and efficiency rating
R403.8	Systems serving multiple dwelling units
R403.9	Snow melt and ice systems
R403.10	Energy consumption of pools and spas
R403.11	Portable spas
R403.12	Residential pools and permanent residential spas
Electrical Power and Lighting Systems	
R404.1	Lighting equipment
R404.2	Interior lighting controls
R406.3	Building thermal envelope

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R406 Energy Rating Index Compliance Alternative

R406.3.1 On-site renewables are not included

Where on-site renewable energy is not included for compliance using the ERI analysis of Section R406.4, the proposed total building thermal envelope UA, which is sum of U-factor times assembly area, shall be less than or equal to the building thermal envelope UA using the prescriptive U-factors from Table R402.1.2 multiplied by 1.15 in accordance with Equation 4-1. The area-weighted maximum fenestration SHGC permitted in Climate Zones 0 through 3 shall be 0.30.

UA Proposed design = 1.15 × UA Prescriptive reference design (Equation 4-1)

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R406 Energy Rating Index Compliance Alternative

R406.3.2 On-site renewables are included

Where on-site renewable energy is included for compliance using the ERI analysis of Section R406.4, the building thermal envelope shall be greater than or equal to the levels of efficiency and SHGC in Table R402.1.2 or Table R402.1.4 of the 2018 International Energy Conservation Code.

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R406 Energy Rating Index Compliance Alternative

R406.7.2.1 Proposed compliance report for permit Application

R406.7.2.2 Confirmed compliance report for a certificate of occupancy

Requirements similar to performance path


RESNET
2015 IECC R-406 Projected Energy Rating Index Report

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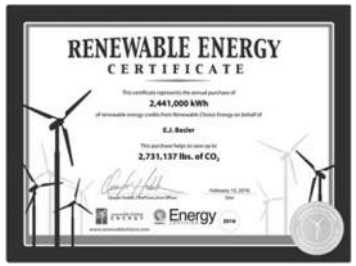
R406 Energy Rating Index Compliance Alternative

R406.7.3 Renewable energy certificate (REC) documentation

Where on-site renewable energy is included in the calculation of an ERI, one of the following forms of documentation shall be provided to the code official:

1. Substantiation that the RECs associated with the on-site renewable energy are owned by, or retired on behalf of, the homeowner.

2. A contract that conveys to the homeowner the RECs associated with the on-site renewable energy, or conveys to the homeowner an equivalent quantity of RECs associated with other renewable energy.



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R407 Tropical Climate Region Compliance Path

R407.1 Scope

This section establishes alternative criteria for residential buildings in the tropical region at elevations less than 2,400 feet above sea level.

1. Not more than one-half of the occupied space is air conditioned.
2. The occupied space is not heated.
3. Solar, wind or other renewable energy source supplies not less than 80 percent of the energy for service water heating.
4. Glazing in conditioned spaces has a solar heat gain coefficient (SHGC) of less than or equal to 0.40, or has an overhang with a projection factor equal to or greater than 0.30.
5. Permanently installed lighting is in accordance with Section R404.
6. The exterior roof surface complies with one of the options in Table C402.3 of the International Energy Conservation Code–Commercial Provisions or the roof or ceiling has insulation with an R-value of R-15 or greater. Where attics are present, attics above the insulation are vented and attics below the insulation are unvented.
7. Roof surfaces have a slope of not less than 1/4 unit vertical in 12 units horizontal (21-percent slope). The finished roof does not have water accumulation areas.
8. Operable fenestration provides a ventilation area of not less than 14 percent of the floor area in each room. Alternatively, equivalent ventilation is provided by a ventilation fan.
9. Bedrooms with exterior walls facing two different directions have operable fenestration on exterior walls facing two directions.
10. Interior doors to bedrooms are capable of being secured in the open position.
11. A ceiling fan or ceiling fan rough-in is provided for bedrooms and the largest space that is not used as a bedroom.

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R408 Additional Efficiency Package Options

R408.2.1 Enhanced envelope performance option

The total building thermal envelope UA, the sum of U-factor times assembly area, shall be less than or equal to 95 percent of the total UA resulting from multiplying the U-factors in Table R402.1.2 by the same assembly area as in the proposed building.

The UA calculation shall be performed in accordance with Section R402.1.5. The area-weighted average SHGC of all glazed fenestration shall be less than or equal to 95 percent of the maximum glazed fenestration SHGC in Table R402.1.2.

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R408 Additional Efficiency Package Options

R408.2.2 More efficient HVAC equipment performance option

Heating and cooling equipment shall meet one of the following efficiencies:

1. Greater than or equal to 95 AFUE natural gas furnace and 16 SEER air conditioner.

2. Greater than or equal to 10 HSPF/16 SEER air source heat pump.

3. Greater than or equal to 3.5 COP ground source heat pump. For multiple cooling systems, all systems shall meet or exceed the minimum efficiency requirements in this section and shall be sized to serve 100 percent of the cooling design load. For multiple heating systems, all systems shall meet or exceed the minimum efficiency requirements in this section and shall be sized to serve 100 percent of the heating design load.

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R408 Additional Efficiency Package Options

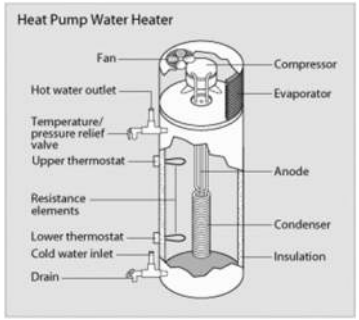
R408.2.3 Reduced energy use in service water-heating option

The hot water system shall meet one of the following efficiencies:

1. Greater than or equal to 0.82 EF fossil fuel service water-heating system.

2. Greater than or equal to 2.0 EF electric service water-heating system.

3. Greater than or equal to 0.4 solar fraction solar water-heating system.



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R408 Additional Efficiency Package Options

R408.2.4 More efficient duct thermal distribution system option

The thermal distribution system shall meet one of the following efficiencies:

1. 100 percent of ducts and air handlers located entirely within the building thermal envelope.

2. 100 percent of ductless thermal distribution system or hydronic thermal distribution system located completely inside the building thermal envelope.

3. 100 percent of duct thermal distribution system located in conditioned space as defined by Section R403.3.2.

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R408 Additional Efficiency Package Options

R408.2.5 Improved air sealing and efficient ventilation system option

The measured air leakage rate shall be less than or equal to 3.0 ACH50, with either an Energy Recovery Ventilator (ERV) or Heat Recovery Ventilator (HRV) installed. Minimum HRV and ERV requirements, measured at the lowest tested net supply airflow, shall be greater than or equal to 75 percent Sensible Recovery Efficiency (SRE), less than or equal to 1.1 cubic feet per minute per watt and shall not use recirculation as a defrost strategy. In addition, the ERV shall be greater than or equal to 50 percent Latent Recovery/Moisture Transfer (LRMT).

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Chapter 5 Existing Buildings

R501.1.1 General

Except as specified in this chapter, this code shall not be used to require the removal, alteration or abandonment of, nor prevent the continued use and maintenance of, an existing building or building system lawfully in existence at the time of adoption of this code. Unaltered portions of the existing building or building supply system shall not be required to comply with this code.

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Chapter 5 Existing Buildings

R501.2 Compliance.

Additions, alterations, repairs or changes of occupancy to, or relocation of, an existing building, building system or portion thereof shall comply with Section R502, R503, R504 or R505, respectively, in this code.

Changes where unconditioned space is changed to conditioned space shall comply with Section R502.

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Chapter 5 Existing Buildings

R501.5 New and replacement materials

Except as otherwise required or permitted by this code, materials permitted by the applicable code for new construction shall be used. Like materials shall be permitted for repairs, provided that hazards to life, health or property are not created. Hazardous materials shall not be used where the code for new construction would not allow their use in buildings of similar occupancy, purpose and location

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Chapter 5 Existing Buildings

R501.6 Historic buildings

Provisions of this code relating to the construction, repair, alteration, restoration and movement of structures, and change of occupancy shall not be mandatory for historic buildings provided that a report has been submitted to the code official and signed by the owner, a registered design professional, or a representative of the State Historic Preservation Office or the historic preservation authority having jurisdiction, demonstrating that compliance with that provision would threaten, degrade or destroy the historic form, fabric or function of the building.

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Chapter 5 Existing Buildings Additions

R502.1 General

Additions to an existing building, building system or portion thereof shall conform to the provisions of this code as those provisions relate to new construction with-out requiring the unaltered portion of the existing building or building system to comply with this code. Additions shall not create an unsafe or hazardous condition or overload existing building systems. An addition shall be deemed to comply with this code where the addition alone complies, where the existing building and addition comply with this code as a single building, or where the building with the addition does not use more energy than the existing building. Additions shall be in accordance with Section R502.2 or R502.3.

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Chapter 5 Existing Buildings Additions

R502.2 Change in space conditioning

Any unconditioned or low-energy space that is altered to become conditioned space shall be required to be brought into full compliance with this code.

Exceptions

1. Where the simulated performance option in Section R405 is used to comply with this section, the annual energy cost of the proposed design is permitted to be 110 percent of the annual energy cost otherwise allowed by Section R405.2.

2. Where the Total UA, as determined in Section R402.1.5, of the existing building and the addition, and any alterations that are part of the project, is less than or equal to the Total UA generated for the existing building.

3. Where complying in accordance with Section R405 and the annual energy cost or energy use of the addition and the existing building, and an alterations that are part of the project, is less than or equal to the annual energy cost of the existing building. The addition and any alterations that are part of the project shall comply with Section R405 in its entirety

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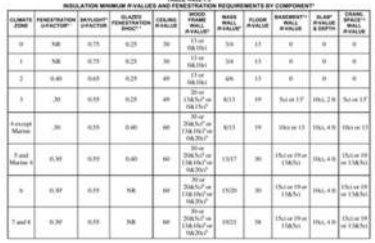
Chapter 5 Existing Buildings Additions

R502.3 Prescriptive compliance

Additions shall comply with Sections R502.3.1 through R502.3.4. R502.3.1 Building envelope. New building envelope assemblies that are part of the addition shall comply with Sections R402.1, R402.2, R402.3.1 through R402.3.5, and R402.4.

Exception: New envelope assemblies are exempt from the requirements of Section R402.4.1.2. (Blower Door)



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Chapter 5 Existing Buildings Additions

R502.3.2 Heating and cooling systems

HVAC ducts newly installed as part of an addition shall comply with Section R403.

Exception

Where ducts from an existing heating and cooling system are extended to an addition.

R502.3.3 Service hot water systems

New service hot water systems that are part of the addition shall comply with Section R403.5.

R502.3.4 Lighting

New lighting systems that are part of the addition shall comply with Section R404.1.

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Chapter 5 Existing Buildings Alterations

R503.1 General

Alterations to any building or structure shall comply with the requirements of the code for new construction, without requiring the unaltered portions of the existing building or building system to comply with this code. Alterations shall be such that the existing building or structure is not less conforming to the provisions of this code than the existing building or structure was prior to the alteration

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Chapter 5 Existing Buildings Alterations

R503.1.1 Building envelope

Building envelope assemblies that are part of the alteration shall comply with Section R402.1.2 or R402.1.4, Sections R402.2.1 through R402.2.12, R402.3.1, R402.3.2, R402.4.3 and R402.4.5.

Exception

The following alterations shall not be required to comply with the requirements for new construction provided that the energy use of the building is not increased:

1. Storm windows installed over existing fenestration.
2. Existing ceiling, wall or floor cavities exposed during construction provided that these cavities are filled with insulation.
3. Construction where the existing roof, wall or floor cavity is not exposed.
4. Roof recover.
5. Roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above or below the sheathing.
6. Surface-applied window film installed on existing single pane fenestration assemblies to reduce solar heat gain provided that the code does not require the glazing or fenestration assembly to be replaced

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Chapter 5 Existing Buildings Alterations

R503.1.1.1 Replacement fenestration

Where some or all of an existing fenestration unit is replaced with a new fenestration product, including sash and glazing, the replacement fenestration unit shall meet the applicable requirements for U-factor and SHGC as specified in Table R402.1.3. Where more than one replacement fenestration unit is to be installed, an area-weighted average of the U-factor, SHGC or both of all replacement fenestration units shall be an alternative that can be used to show compliance.

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Chapter 5 Existing Buildings Alterations

R503.1.2 Heating and cooling systems

HVAC ducts newly installed as part of an alteration shall comply with Section R403.

Exception

Where ducts from an existing heating and cooling system are extended to an addition.

R503.1.3 Service hot water systems

New service hot water systems that are part of the alteration shall comply with Section R403.5.

R503.1.4 Lighting

New lighting systems that are part of the alteration shall comply with Section R404.1.

Exception

Alterations that replace less than 10 percent of the luminaires in a space, provided that such alterations do not increase the installed interior lighting power.

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Chapter 5 Existing Buildings Repairs

R504.1 General

Buildings, structures and parts thereof shall be repaired in compliance with Section R501.3 and this section. Work on nondamaged components necessary for the required repair of damaged components shall be considered to be part of the repair and shall not be subject to the requirements for alterations in this chapter. Routine maintenance required by Section R501.3, ordinary repairs exempt from permit, and abatement of wear due to normal service conditions shall not be subject to the requirements for repairs in this section.

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Chapter 5 Existing Buildings Repairs

R504.2 Application

For the purposes of this code, the following shall be considered to be repairs:

1. Glass-only replacements in an existing sash and frame.

2. Roof repairs.

3. Repairs where only the bulb, ballast or both within the existing luminaires in a space are replaced provided that the replacement does not increase the installed interior lighting power

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Chapter 5 Existing Buildings Change of Occupancy

R505.1 General

Any space that is converted to a dwelling unit or portion thereof from another use or occupancy shall comply with this code.

Exception

Where the simulated performance option in Section R405 is used to comply with this section, the annual energy cost of the proposed design is permitted to be 110 percent of the annual energy cost allowed by Section R405.2.

R505.1.1 Unconditioned space

Any unconditioned or low-energy space that is altered to become a conditioned space shall comply with Section R502

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CHAPTER 6 [RE]
REFERENCED STANDARDS

ACCA

Air Conditioning Contractors of America
1330 Braddock Place, Suite 350
Alexandria, VA 22314

ANSI/ACCA 2 Manual J—2016: Residential Load Calculation
R403.7

ANSI/ACCA 3 Manual S—2014: Residential Equipment Selection
R403.7

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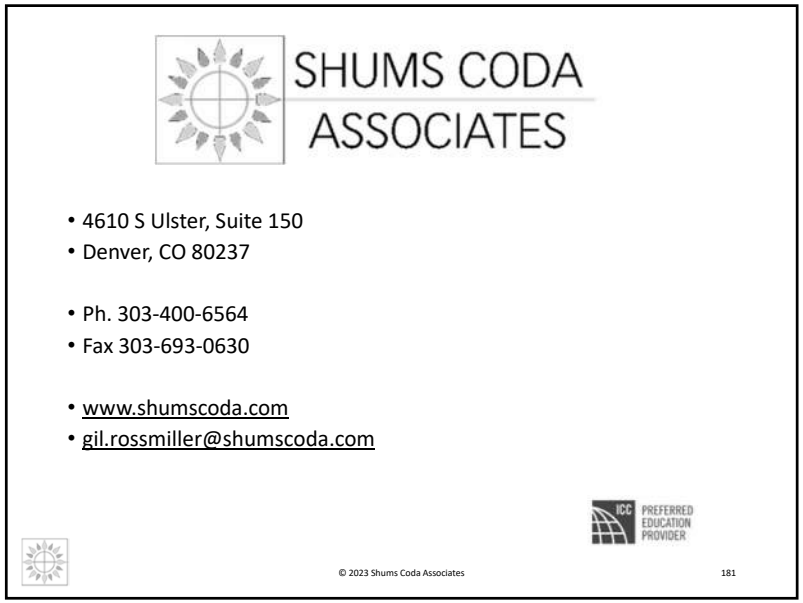

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